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94th Congress } JOINT COMMITTEE PRINT
1st Session }

CHINA: A REASSESSMENT OF THE ECONOMY

A COMPENDIUM OF PAPERS

SUBMITTED TO THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

JULY 10, 1975

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LETTERS OF TRANSMITTAL

JULY 8, 1975.

To the Members of the Joint Economic Committee:

Transmitted herewith for use by the Joint Economic Committee, the Congress, and the interested public is a factual and analytical study of the economy of the People's Republic of China entitled "China: An Economic Reassessment." This is a compilation of invited papers designed to meet the interests of the committee and the Congress in an up-to-date body of factual data and interpretative comment on the state of the domestic economy of China, including the record of its recent experience in economic development and its relations with the outside world.

Early in the Great Proletarian Cultural Revolution the Joint Economic Committee released a pioneering, two volume assessment, entitled "An Economic Profile of Mainland China" (1967). As the People's Republic of China began to relate more with the world community through its membership in the United Nations it seemed appropriate to supplement the earlier study by a presentation of information and analysis that has become available to the various Departments of the Federal Government. Therefore the "People's Republic of China: An Economic Assessment" was released by the committee in 1972.

China, the largest nation in the world, remains both an enigma and a potential factor in world stability. Certainly, the Chinese economy is a subject of primary concern, and we have an obvious and compelling need of knowledge on the subject. This extensive compilation was organized by the staff in the hope that it will help to serve this need. It covers all of the major aspects of the Chinese economy and should provide a valuable source book for further committee studies of the subject. It is our intention to follow this study with hearings at governmental and nongovernmental experts may testify, thereby helping the Congress to obtain a clear view of what is taking place in China.

In the wake of United States withdrawal from Vietnam and Cambodia, it is especially timely that we review all aspects of our policy with the People's Republic of China. Such a review may also be useful in guiding the Congress toward a new, more informed role in foreign policy formulation. Many of us have been fortunate enough to travel to China recently to view the people and talk with the Chinese leaders first hand. This comprehensive volume will add depth and insights to those impressions.

Our earlier volumes provided a factual basis for better understanding of the economy of China. We hope this volume will not only update this earlier effort but provide a current reassessment. The sources of information on China are still limited but better than during the earlier studies.

It is hoped that this volume, drawing on research at universities, research institutions and in the Federal Government, will serve as an aid and a stimulus to all scholars working on this subject. The committee is deeply indebted to the scholars from Government and academia who gave so generously of their time and expertise to the committee. They are listed in the executive director's memorandum to me, and I would like to take this opportunity on behalf of the committee of expressing our gratitude for their invaluable efforts without which this study would not have been possible.

Finally, we wish to take this opportunity to express our gratitude to the Congressional Research Service for making available the services of John P. Hardt, who helped to plan the scope of the research and coordinated the contributions for the present study.

It is understood that the views contained in this study are not necessarily those of the Joint Economic Committee nor of individual members.

HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee.

JULY 3, 1975

Hon. HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a volume of materials on the economy of the People's Republic of China entitled "China: An Economic Reassessment." The study has been prepared in the form of a symposium containing a series of selected papers contributed by invited specialists who are recognized authorities on China. The specialists in question have been drawn from the ranks of the universities here and abroad, private research institutions and the several departments of the Federal Government and the Library of Congress. The papers they have submitted, in response to our request, cover the broad range of topics dealing with the recent performance of Chinese economy. Included among these topics are economic policy, the defense burden, agriculture, transportation, industry, population, the environment, technology transfer, international trade, financing, Sino-Japanese economic relations, and foreign aid.

The Joint Economic Committee undertook an earlier study, the two-volume "Economic Profile of Mainland China," to provide a basic body of information on the economy of Communist China. In 1972 the committee released a compendium entitled "People's Republic of China: An Economic Assessment." The current study is intended to supplement the earlier studies by a presentation of information and analysis that has become available to the various Government agencies during the last several years.

It is hoped, furthermore, that the facts and ideas presented in this survey of available information will help to shed light on the alternatives facing the United States in ordering our relations with the People's Republic of China within the foreseeable future. The shape of these relations is certain to be significant both for the internal development of China and critical to the issue of war and peace in the world.

The contributors to the study have been most considerate of our needs and generous in giving of their time and expertise to provide not only basic information but indispensable analytical perspective on this important subject. The individual scholars who have participated in the preparation of the present study are:

Arthur G. Ashbrook, Jr.
Martha Avery
Nai-Ruenn Chen
William Clarke
Jack Craig
Frederick W. Crook
David L. Denny
Robert F. Dernberger
James D. Egan
Alva Lewis Erisman
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Thomas G. Rawski
Carl Riskin
Charles Robert Roll, Jr.
Jon Sigurdson
Eugene A. Theroux
Alfred H. Usack, Jr.
Bobby A. Williams
Kung-Chia Yeh

In addition, the committee received the wholehearted cooperation from the following agencies of the Government, private research institutions and universities:

Brookings Institution
Bureau of East-West Trade, Department of Commerce
Columbia University
Economic Research Service, Department of Agriculture (Consulate in Hong Kong)
George Washington University
Harvard University
Office of Economic Research, Central Intelligence Agency
University of Michigan
Library of Congress
The RAND Corporation
University of Lund (Lund, Sweden)
University of Toronto (Canada)
National Council for U.S.-China Trade
Queens College (New York City)
Scandinavian Institute of Asian Studies (Copenhagen, Denmark)

It should be clearly understood that the views expressed in these papers are those of the individual contributors and do not necessarily represent the positions of the respective executive departments, the Joint Economic Committee, individual members thereof, or the committee staff.

The Library of Congress made available the services of John P. Hardt, senior specialist in the Congressional Research Service, who helped to plan the scope of the research and to coordinate the contributions for the present study.

Mr. George D. Holliday of Congressional Research Service assisted Dr. Hardt in this task. We are also indebted to Professor Alexander Eckstein, on leave from the University of Michigan who conducted a monthly luncheon meeting at the Brookings Institution during the course of preparation of many of the papers for this compendium. That luncheon seminar and the useful advice from Professor Eckstein was most helpful in the preparation of the volume.

JOHN R. STARK,
Executive Director, Joint Economic Committee.

CONTENTS

SUMMARY

By John P. Hardt

Economic policy and performance are as important in the People's Republic of China as in other major countries in the world. The economic preoccupations of the Chinese leadership were illustrated by the published reports of the proceedings of the Fourth National People's Party Congress and the new Constitution unveiled at that Congress in January 1975. The current Fourth Five-Year Plan (1971–75) appears to be reasonably successful in meeting targets and providing for priority needs. This recent success, in part, reflects a climate more conducive to economic growth and efficiency than the disruptive earlier environments of the Cultural Revolution (1966–69) and the Great Leap Forward (1958–61).

In a measured way China has also opened its economy to commercial and technological relations with the West. Political normalization and increased requirements for imports from industrially advanced nations have together permitted and encouraged this modification of the Chinese policy of economic isolation and self-sufficiency.

This volume follows two earlier compendia on the Chinese economy: "Economic Profile of Mainland China" (1967), and "People's Republic of China: An Economic Assessment" (1972). Hearings related to those earlier volumes were also published. The current volume updates and expands the coverage of the earlier publications. The 28 contributors are more than double the number in the 1972 volume. The participants represent academic institutions in the United States, Canada, and Sweden, various departments of the U.S. Government and research institutions.

The compendium is organized into five sections: Policy Assessments and Performance, Urban and Industrial Development; Rural and Agricultural Development; Defense Economics, and Commercial Relations. Some of the major questions addressed in the studies, with indications of some of the answers, are illustrated below:

1. *Has the economy of the People's Republic of China settled down to a stable, continuous process of economic growth?*

The performance of the current Fourth Five-Year Plan (1971–75) is second only to the initial Five-Year Plan period (1953–57). Although the recent performance should not be projected mechanically, future prospects under a regularized planning process should seem encouraging to Chinese leaders:

> Outside of political upheavals, the main challenges to the Chinese economy over the next 25 years will be to incorporate a more complex mix of products into the system, to maintain a spirit of hard work and sacrifice in a generation with no memory of national or personal humiliation, and to keep the lid on consumption in an era of universal education and advancing technology. (Ashbrook, p. 21.)

Moreover, in spite of the disruptive past efforts of the Great Leap Forward and Cultural Revolution policies on Chinese economic performance, political upheavals may not seriously affect long-term performance:

> Finally, as any observer of the Chinese experience over the past 25 years must know by now, the Chinese leaders do not passively accept the unexpected, or expected, but underestimated, economic consequences of their policy decisions. Undesirable or unaccepted results of one policy soon generate new policies to ameliorate those results; the Chinese leadership has shown itself to be remarkably willing and able to experiment within the basic context of their ideological premises and innovate with considerable ingenuity to counter and eliminate the undesirable consequences of their policies. (Dernberger, p. 470.)

2. *Do improved access to China through exchanges, increased disclosure of economic data, and improved reliability of information permit a better assessment of Chinese economic performance?*

> In sum, Chinese statistics in terms of their availability, reliability, and usability are fraught with problems and difficulties. From the vantage point of 1975, the First Five-Year Plan (1953–57), particularly the latter half of it, may be viewed as a golden period for Chinese statistics, although in those years published Chinese data were by no means plentiful and of high quality by the standards of advanced countries. Being kept in a statistical darkness for a decade, economic researchers on China in the 1960's were nearly desperate as they reached the point of no returns. The gradual resumption of some statistical outflows from China since 1970 has opened new research possibilities. To be sure, there are many deficiencies and pitfalls in Chinese statistics, particularly those published in recent years. With patience, care, and ingenuity one could construct certain meaningful estimates on the basis of the statistics that China has so far made public. (Nai-Ruenn Chen, p. 68.)

Western professional demographic estimates on Chinese population vary widely. The most authoritative United Nations' figures for 1975 indicate that it may be less than 830 million, depending on assumptions, while it is estimated to be over 930 million by the Foreign Demographic Analysis Division of the U.S. Department of Commerce. The fact that the last and only Census during the life of the People's Republic of China is a distant base for estimates is part of the problem.

> * * * Peking does not really know the size of China's population or the precise rate at which it is growing. * * *
>
> Perhaps the often-quoted statement by Li Hsien-nien to a Cairo newsman in 1971 and repeated, essentially, in 1972 to the members of a delegation representing Japanese airlines, summarizes the population numbers game best of all. Li reported that the officials at the supply and grain department use a population of 800 million, the officials outside the grain department use 750 million, the Ministry of Commerce "affirms that the number is 830 million," while the planning department "insists that the number is less than 750 million." He concluded that "unfortunately there are no accurate statistics in this connection." (Orleans, pp. 70–71.)

3. *By provincial decentralization in planning has China developed along an uneven pattern of economic development or has it followed a balanced, more egalitarian regional development approach?*

> * * * the Chinese adoption of the relatively centralized Soviet model of economic planning was also partially determined by important distributional and equity goals held by the leadership. The first of these was the desire to begin to realign the geographic distribution of industry. The inherited pattern of industrial development, in which industrial output capacity was concentrated in the Northeast and a few major coastal enclaves, was viewed as the result of over a half-century of foreign domination of the domestic economy. Their determination to reverse this pattern of industrial concentration was motivated not only by strategic military considerations but also by the belief that, in the long run, growth that led to increasing regional disparities in the level of development was not politically acceptable. Secondly, the leadership was committed to insuring a more equitable distribution of government services. In large areas of the country in 1949 there was a virtual absence of health care facilities, education institutions, and other important social services. (Lardy, p. 96.)

The 1950's saw substantial change, but recent data indicate that from 1957 to the 1970's there was little change in the relative shares of the regions in the gross value of industrial output. (Roll and Yeh, p. 81.)

An analysis of central-provincial fiscal relations provides empirical evidence which suggests that the central government continued to exercise broad planning powers and that this has had a profound effect on the character of Chinese economic growth. This evidence suggests that provincial planners have not had a substantially increased role in determining the allocation of the country's economic resources and that, as a result, economic growth since the decentralization has not been characterized by a strong pattern of regional self-sufficiency. In fact, the degree of geographic redistribution of resources carried out by the Chinese central government is rather striking, particularly when compared with other large, less developed countries such as India. (Lardy, p. 95.)

In summary, it is our opinion that several factors have led to equal aggregate output growth despite an investment balance in favor of the interior. These are input constraints in the textile industry, derived demands for coastal output generated by inland industries and agriculture, emphasis on self-sufficiency and new product. * * * emphasis on the coastal areas for development purposes suggests a pragmatic approach to the full utilization of resources to attain more than one goal. Moreover, if China's leaders had not adopted the policy favoring inland areas, China almost certainly would have developed as a dual economy. (Roll and Yeh, p. 93.)

4. *Is it too early in its development process for the PRC to concern itself with its environment?*

There is no such thing as a safe prediction for China, but it does seem that because of this combination of wisdom and "luck" China will not experience the type of environmental degradation that is now present in most of the world's industrial nations.

China has been wise because very early on Mao Tse-tung recognized that the long-term success of economic development required that the people be protected from the hazards of environment and that the environment be protected from uncontrolled abuse. This resolve was based on very practical rather than strictly ecological considerations—long before the limited fad for ecology grew into a major international concern. Mao firmly believed that the basic physical needs of the population—good health, good water, adequate food—were prerequisites to any and all other national goals, hence, the early policies to improve sanitation and health and to make the land more productive. Only after these needs were largely achieved could environmental concern turn to some of the important, but relatively less pressing, problems stemming from industrial pollution.

"Luck" becomes a factor only at the implementation stage of some of the progress. China is "lucky" that more than four-fifths of her population is located in rural areas, where lower densities and essentially agricultural pursuits make environmental problems easier to manage. She is "lucky" that she does not have an economy of abundance which is so damaging to the environment, but rather an economy of frugality in which the "do not waste" ethic is relatively easy to enforce since, of necessity, it is inherent in the society. (Orleans, pp. 143–144.)

5. *How has Chinese industry grown? Is it likely to slow down in the near future? Has Chinese industrial growth taken on its own pattern of modernization different from both the Soviet and Western industrialization models?*

Industrial production in China * * * grew at an average annual rate of 13 percent during the years 1949–1974. The experience in the 1950's was quite different from that of the 1960's and 1970's. The average annual rate of growth during the period 1949–1950 was 22 percent, whereas the rate for the period 1960–1974 was only 6 percent. * * *

Despite accumulating structural problems and the poor performance in 1974, industrial production in the remainder of the decade should get back to the recent growth trend of 8 to 10 percent. * * *

Chou singled out the Fifth Five-Year Plan period (1976–1980) as crucial for the attainment of "front rank" status for China by the end of the century. The basic economic problem for the People's Republic of China is to boost the growth rate of grain production well above the rate of population growth. The degree of success the Chinese have in promoting birth control and in raising agricultural production will be important determinants of the rate of industrial growth, influencing, for example, the amount of investment resources that can be spared for the expansion and modernization of heavy industry. (Field, pp. 149, 159.)

6. *How does the Chinese system of industrial management differ from that of other industrial nations? With a continued deferment of increases in consumer goods availability, how are workers' incentives and increased labor productivity attained?*

China's system of planned socialist industrialization aims at rapid transformation of the economy by mobilizing resources to raise output for investment and defense as well as for consumption. Consumer preferences, including individual desires for leisure both on and off the job, occupy a distinctly subordinate position in the constellation of official goals.

In light of these objectives, our evaluation of performance in China's post-1949 industrial system must be broadly favorable. The preceding survey has shown that reliance on administrative rather than market control over resource allocation has contributed to China's achievements in raising the level, changing the structure and compressing the real cost of industrial output. This finding draws support from favorable comparisons of industrial growth in China and in other large industrial latecomers, and also from the revealed preference of the industrial democracies for nonmarket distribution of essential resources in wartime, when resource mobilization and rapid structural change replace consumer welfare as primary national goals.

It is entirely possible that with their relatively static product mix, modest growth rates and markets which show signs of becoming less homogeneous as personal incomes rise, China's consumer industries could benefit from a substantial shift toward market-linked methods of allocation. But in the dominant producer sector, the continuing prominence of ambitious targets, technical uncertainty and unpredictable demand suggests that as in the past 25 years, fundamental institutional change holds little prospect for improving the performance of China's industrial system. (Rawski, pp. 196–197.)

* * * urban-rural differences still provide a reason for Chinese to become industrial workers; that horizontal allocation of labor within industry is done without much reference to material incentives; and that wage differentials tied to occupation and skill stimulate work performance and skill acquisition only in a limited manner.

* * * having been led to anticipate an important role for internal incentives in industry by the relative weakness of external ones, we are finally drawn to the conclusion that their function can hardly be distinguished from that of other institutional features of the "continuing revolution" in China. It seems that the clue to the motivation of the Chinese worker, as to that of any other, is ultimately to be found in the threads that bind him to society. (Riskin, pp. 222, 224.)

7. *Is China self-sufficient in oil and gas? Will the PRC become a major petroleum and petroleum products producer and exporter?*

The rapid emergence of the PRC as a major oil and gas supplier has not only economic but geopolitical significance.

The emergence of the People's Republic of China as a major oil producer and oil exporter is a recent phenomenon. Prior to 1949, Chinese petroleum output was insignificant. As part of its general program of building up industrial strength and reducing dependence on foreign sources of supply, the new government undertook an intensive exploration and development effort in the oil industry. The payoff was the discovery in 1959 and the subsequent rapid development of the huge Ta-ch'ing oilfield in Manchuria's Sung-Liao Basin. Additional large discoveries—in the North China Basin in particular—have eliminated the PRC's dependence on foreign oil, insured an abundant supply of oil for the modernization of the Chinese economy, and enabled Peking to export sizable amounts of oil, beginning in 1973.

The salient points * * * are as follows:

China produced 65 million tons of crude in 1974 and was the world's largest producer, just behind Indonesia.

Proved reserves are conservatively estimated at 1.1 billion metric tons. Proved plus probable reserves are estimated at 5.9 billion metric tons and could easily be 7.6 billion metric tons. Offshore reserves will add appreciably to these estimates.

Current exploration is concentrated in existing fields and in the Pohai Gulf. At least three jack-up rigs and perhaps a semi-submersible are working in the Pohai.

Exports of crude rose to more than 4 million tons in 1974 and should exceed 8 million tons in 1975, earning the Chinese more than $700 million.

In 1974, oil accounted for 17 percent of the primary energy produced in China, up from 2 percent in 1957 and 11 percent in 1970. Industry and transportation are the largest consumers of petroleum. Agriculture is consuming a rapidly growing share, up from 9 percent in 1957 to 15–20 percent today.

China is the world's fifth largest producer of natural gas. Output in 1974 was approximately 60 billion cubic meters, 52 billion cubic meters of which was produced in Szechwan Province.

Refining capacity at mid-year 1974 is estimated at up to 47 million metric tons. The industry, whose technology is comparable to Western refining industries in the late 1950's, satisfies China's product needs.

Since 1974, the People's Republic has added almost 2,000 kilometers of new pipeline, largely to facilitate oil exports, and has invested heavily in port and handling facilities and tankers.

By 1980, China should be producing more than 200 million tons of crude oil annually of which approximately 50 million tons may be exported.

Peking is unlikely to allow foreigners to participate extensively in the development of its oil resources. For the foreseeable future, dealings with outsiders willl be limited to straightforward purchases of equipment, technology, and services. (Williams, pp. 225–226.)

Some Japanese sources expect oil exports to rise from the current level of around 5 to as much as 25 million metric tons by 1978.

If PRC exports reach levels predicted by some Japanese sources they could earn the following amounts (at $12.85 per barrel) in future years: 1978—$4 billion (45 million metric tons); 1985—$9 billion (100 million metric tons); 1988—$12 billion (135 million metric tons).

By 1990 China may join Saudi Arabia, Iran, the United States and the Soviet Union as one of the five major oil-producing nations if a Japanese estimate of production of 450 million metric tons is exceeded. (Kim, pp. 606–607.)

8. *Are Chinese industrial branches, e.g., iron and steel, comparable to similar branches in other industrial nations?*

In its first 25 years, the People's Republic of China has made rapid progress in developing the key iron and steel industry. With the help of the Soviet Union, a number of large iron and steel bases were developed in the 1950's. Since then, advances have been made on the basis of China's own efforts and selective help from non-Communist countries. Some new technology has been introduced—particularly the basic oxygen furnace which has increased production efficiency—and the quality and variety of steel products have improved. Annual production of crude steel is now in the neighborhood of 25 million metric tons, making China the sixth largest producer in the world.

China has the potential for a much larger iron and steel industry. Three factors have been holding back development:

China's domestic resources of iron ore and coal, although plentiful, are of a low quality and must be given special treatment. * * *

The Chinese had not yet trained a fully competent work force when the Soviet technicians were withdrawn in 1960. * * *

Capital shortages in the general economy have led to imbalance in the iron and steel industry. For example, the mining sector has been allocated a minimum of capital forcing it to operate in a labor-intensive fashion. * * *

The Chinese are moving to correct these deficiencies, mostly through imports of modern capital equipment. Mining and ore beneficiating equipment and a large steel finishing facility have been purchased in the last few years.

Installation of this equipment will take several years, and demand for steel products will meanwhile continue to rise. Therefore, the present imbalances probably will persist through the 1970's, with output rising at only a moderate rate. Beyond 1980, progress in the industry will depend on how rapidly the

PRC improves its own capacity to produce the needed machinery and equipment and how willing it is to devote large amounts of foreign exchange to pay for steelmaking equipment and technology. (Usack and Egan, pp. 264–265.)

China relies heavily on Japan for basic metal.

Since 1968 Japan has exported over one million tons of iron and steel annually and China is Japan's second largest customer (the United States is the largest). Japan exported 1.4 million tons in 1972—7–8 percent of its total steel exports. Iron and steel account for over 40 percent of Japan's total exports to China, being the single largest export item. Thus, China is an important and stable market for the Japanese iron and steel industry.

The large volume of Sino-Japanese trade in iron and steel can be ascribed to several factors: the coincidence of China's increased demands and Japan's production capacity; geographical proximity; the quality of Japanese product; Japan's reputation for making deliveries on time; and a relatively low price.

Apart from the question of China's continued demands, there is some question regarding Japan's export capacity. Japan's steel production will face numerous difficulties—environmental problems, energy problems, labor problems—and may be unable to maintain its high rate of growth. (Kim, p. 608.)

9. *Has China developed a modern domestic and international telecommunications system? Is its development based on the expansion of Chinese production capability, imports, or both?*

For nearly a quarter of a century, the People's Republic of China has engaged in a series of programs aimed at establishing a telecommunications system that would meet the basic needs for the economy, the government, and the armed forces. When the Communists achieved power in 1949, they inherited a primitive and badly damaged telecommunications system. For the next three years, the main task was to restore the system to its former state to satisfy the most pressing communications needs of the new government.

By 1953, the Communists were prepared to expand the existing system and to link the major provincial cities to Peking by open wire trunklines. Substantial progress was made during the First Five-Year Plan (1953–57), although the Chinese were heavily dependent on Soviet and East European equipment and technology. In 1958, as part of the euphoric Great Leap Forward, Peking announced a new four-year plan to establish a modern telecommunications system, complete with high-capacity microwave radio relay and coaxial cable trunk routes. Shortages of material and equipment, the withdrawal of Soviet assistance in mid-1960, and the general collapse of the Leap Forward forced the Chinese to postpone their highly ambitions program.

After a pause in the early 1960's, expansion of the telecommunications system was again given high priority.

Greater attention was given to the development of the electronics industry. Complete plants for the production of electronic components and test instrumentation were imported from the West. The Cultural Revolution (1966–69) caused a sharp but short-lived cut in industrial production. The adverse effect of the production of telecommunications equipment was temporary, and the technological improvement and the expansion of the capacity of the electronics industry continued.

The most significant achievement during China's current Five-Year Plan (1971–75) has been the construction of an arterial network of long-distance telecommunications facilities to provide the transmission base for future increases in the flow of conventional and specialized telephone, telegraph, and video traffic. Other achievements during this period have been the spread of radio, wire diffusion, and television broadcasting facilities and the establishment of a nationwide television network. This has been accompanied by substantial increases in the production of radio and television receivers and wired loudspeakers. Progress also has been made in augmenting both facsimile facilities and automating conventional telegraph operations as well as in enlarging and automating telephone exchanges. These achievements have fulfilled China's basic needs for long-range development of a domstic telecommunications system.

Progress also has been made in developing China's international telecommunications. Since 1972, three standard Intelsat ground stations have been purchased from the United States. A coaxial cable link has been established between Canton and Hong Kong, and agreement has been reached with a Japanese consortium to lay a coaxial submarine cable from Shanghai to Japan. Efforts also are being made to improve the quality of radio telephone circuits and to expand international telecommunications by using the transit relay services offered by major world telecommunication centers. * * * (Craig, p. 290.)

10. *How has the organization and performance of the construction sector contributed to the formation of capital in the PRC?*

In a developing country, construction typically grows faster than GNP. This trend holds true for the People's Republic of China. Reverses, attributable to the Great Leap Forward (1958–60) and the Cultural Revolution (1966–68), depressed all indexes. Construction and industrial output were more volatile than GNP: both fell further than GNP in bad times and grew faster in good times.

Current construction activity in China reflects the revised investment priorities of late 1972 and 1973, under which Peking is attempting to bolster deficiencies in agricultural and industrial performance. Construction activity now features industrial projects supporting agriculture, the buildup of electric power capacity, port and harbor improvements, and capital improvements in the raw materials industry (mining). China in 1973 contracted with Japan, the United States, and Western Europe for $1.2 billion worth of industrial plants—mainly chemical fertilizer and artificial fiber plants. In 1974, plant purchases were about $900 million, dominated by the steel rolling mill (more than $500 million) to be built at Wu-han.

For the next two to five years, construction activity will feature industries producing chemical products, raw materials, and electric power. This activity will include the construction of the numerous foreign plants now under contract. Construction in the mining industry will give priority to opencut mining, a technology in which China has much to learn from the West. Construction of major new facilities at international ports will parallel the expansion of foreign trade. The steel industry will continue to have high priority in construction, with the major emphasis on capacity to produce finished steel. The petroleum industry has been speeding up its already fast pace. Development during the next few years will give top billing to oil pipelines and to the opening up of offshore deposits in the shallow Pohai Gulf. (MacFarlane, pp. 314, 322.)

11. *What are the limits or constraints on the growth of agricultural output? Even with burgeoning population will the Chinese be able to adequately feed and clothe their population?*

In spite of serious attention and significant progress agricultural performance remains a major economic variable. How well the PRC will be able to cope with the problem of improved performance is a subject on which specialists differ.

Peking has assured itself of grain for the medium term and has made the sizable adjustments in investment priorities necessary for longer term solution to the agricultural problem.

Major changes include:

Concluding multi-year agreements with Canada, Australia and Argentina to provide a maximum of 4.8 million tons of grain annually through 1976.

Downgrading the concept of the small plant churning out low quality inputs.

Importing 13 large chemical fertilizer plants to provide firstclass inputs and synthetic fiber plants to supplement supplies of natural fibers.

Intensifying work on capital construction projects to improve and extend farmland.

Limiting sideline activities that might interfere with peasant obligations to the collective.

Increasing the acreage of grain crops by expanding multiple cropping and limiting the acreage of industrial crops.

The fertilizer plants are the key to China's agricultural development. When the last of these plants come into operation in 1978 or 1979, China's supply of nitrogen fertilizer will reach 8.0 million tons, double the current availability. The giant increment in nitrogen fertilizer clearly will be a major shot in the arm for agriculture although marginal returns will probably be low, at least initially, because fertilizer will outstrip the availability of complementary inputs—effective water control; very high yielding varieties of seed; sufficient trace elements, phosphoric and potassium fertilizers of agricultural chemicals, etc.—necessary for top yields. Even so, grain output could increase to about 300 million tons by 1980. Peking's use of its limited scientific capabilities to achieve practical short term objectives (such as simple seed selection and crossing) rather than to do basic, in-depth research (such as sophisticated varietal development) may prove to be the most serious impediment to China's progress in modernizing agriculture.

Through the rest of this decade China will continue to rely on imports to maintain consumption, especially in years of below-normal harvests. Moreover, China's population and hence requirements for food and fiber for domestic consumption will also increase. Even with the accelerated programs to modernize agriculture, the PRC may not be able to attain self-sufficiency in both grain and essential non-grain crops by the end of this decade. (Erisman, pp. 325–326.)

The problems that Chinese agriculture will have to face over the coming decade differ markedly from those in other less developed countries. There are no obvious and gross inefficiencies in Chinese farming that could be quickly overcome if only the rural population would understand the needs to do so or if an effective extension service could be created that could teach them new methods. The Chinese extension service based in the commune system appears to have been functioning well for a decade or more. Where in the early 1960's there was a considerable backlog of new technology waiting on government actions to supply the required inputs, there is no comparable backlog today. And therein lies the problem.

At no time since 1949 have increases in Chinese farm output been achieved with ease, but there is reason to believe that future increases will require even greater effort and an effort of a somewhat different kind from that in the past. Future expansion is not simply a matter of digging more tube wells or pouring on more chemical fertilizer although both will help. New breakthroughs are required in the basic agricultural sciences in China and in the harnessing of the irrigation potential of China's northern rivers. * * *

* * * it is clear that China's shift in priorities toward agriculture in the 1960's was both real and large in scale. * * *

For all this outpouring of effort and resources, however, there was no enormous leap in farm output. Agricultural production did rise, but at a rate only a little above population growth if the 1957–1974 period is taken as a whole. Rural incomes per capita did rise by more than this, but mainly as a result of the improvement in the agriculture-industry terms of trade.

The main reason why agricultural growth has not been faster appears to be simply that China is attempting to achieve large farm output increases under basically unfavorable conditions. When land under cultivation cannot be extended except at enormous expense and when inputs of fertilizer, water, and labor are already being intensively utilized, the return on further additions of these same inputs will not be high.

For the future, there is every reason to believe that Chinese agricultural output will continue to grow although no major breakthroughs appear to be in sight. To achieve this continued growth, however, some shift in emphasis in China's agricultural policies is probably necessary. The silt problem of China's northern rivers will have to be solved. There will also have to be a considerable improvement in the quality of China's research in the basic sciences. These changes appear to be well within China's capacities and they are likely to be carried out if for no other reason than that China appears to have few other options. China is simply too big to follow the lead of Japan or Europe and rely increasingly on imports to meet its food needs. (Perkins, pp. 350, 365.)

12. *How is agriculture in the PRC organized to provide incentives and a measure of efficiency?*

China's commune system consists of four parts: commune; brigade; team; and household. This system, born in the optimistic fervor of the Great Leap Forward in 1958, was reduced to a skeleton during the lean years from 1959–62, but has developed greatly in the past 12 years.

Currently, China has 50,000 communes, about 25,000 less than the number in existence in 1963. Essentially the commune level functions as the basic unit of local government. This level is charged with the responsibility of procuring grain, collecting taxes, providing public security, and reporting statistics and information to higher levels. In addition, it formulates specific production plans for its subordinate units after adapting policies received from higher levels to local conditions. The commune also provides leadership for the management of water resources, construction, afforestation, and transportation projects which require the direction and control of a large organizational unit. Moreover, it manages local industries which produce consumer and producer goods for local consumption. * * *

The persistence of the team as the basic unit and similarities in organization and ownership patterns of contemporary communes with those in 1962 tend to mask important changes which have taken place in the past 12 years at commune and brigade levels. These levels provide more services, control more inputs, have better trained cadres and stronger Party organizations than they did in 1962. Indeed, there has been ideological pressure in the Party to abolish the team and amalgamate households directly into brigades bringing agriculture one step closer to ultimate socialization. This pressure, understandably, has been supported by poorer teams desiring to increase their share of collective income. However, pressure to change the status of teams has been arrested by the newly passed 1975 Constitution which specifically sustains the continued functioning of these units. Moreover, the requirements of China's labor intensive agriculture necessitates a unit similar to the team in size and organization, which can effectively manage and motivate the farmers of China to produce the foodstuffs needed for this country's huge and growing population. (Crook, pp. 366–367.)

13. *Is regional, rural dispersion of economic activity in China a result of economic or political choice or a product of necessity?*

The encouragement of small-scale industries in rural areas in China is an essential element of regional development programs which today focus on agricultural development and diversification, local raw material utilization, resource mobilization and long term employment impact.

However, rural industry in China is not a homogenous concept as it is the outflow of two different strategy approaches. First, it is the logical outcome of a *sector strategy* involving technology choices in a number of industrial sectors—most of which were initiated during the Great Leap Forward or earlier. This has required the *scaling down* of modern large-scale technology through a product and/or quality choice combined with design changes in the manufacturing process. Second, rural industry is part of an *integrated rural development strategy*—also initiated during the Great Leap Forward—where a number of activities are integrated within or closely related to the commune system. They are often rooted in the traditional sector of the economy and have often been preceded by a long tradition of village crafts. Such industries are often based on the *scaling up* of village crafts. The scaling up of cottage industries in China is not based on improvement of technology alone, but the cottage industries have been converted into modern small-scale industries through cooperativization, electrification and access to low cost simple machinery. * * *

The justification of rural industrialization is economic as well as political. Economic growth may, however, in the short run have been sacrificed because of the need to transfer technical, financial and planning resources to rural areas in order to start rural industrialization is likely to contribute to a more rapid economic growth than would otherwise have been possible. Firstly, a decentralized pattern of urban development is likely to lead to a less capital-intensive expansion of industrial growth, which is better adapted to prevailing factor availabilities and relative factor prices. Secondly, if a majority of the rural population—through integrated rural development—might be persuaded to remain in villages and expanding county capitals, this is likely to require less investment for expanding large urban centers. Thirdly, rural industrialization provides the opportunity of simultaneously promoting agricultural and non-agricultural elements in the same local areas and non-agricultural elements are just as dependent on a thriving increase in farm output and income as the latter are dependent on them. Fourthly, a rural industrialization which has a strong core of local engineering enterprises is likely to play an important role in any decentralized industrialization policy. (Sigurdson, pp. 411, 433.)

14. *What does an assessment of Chinese military force development and use of force reveal about the strategic policy of the PRC?*

* * * The professional judgments on Chinese strategic policy have been based on a review of the kinds of forces the PRC had developed and maintained and the use to which these forces have been put. From this assessment some central conclusions have been reached:

(1) A primary PRC objective has been adequate physical security. Current and future requirements are primarily to be prepared to meet substantial ground incursions from the Soviet Union and to avoid Vietnam-type destruction of their industrial and transportation systems.

(2) A secondary strategic policy objective is that of reasserting territorial integrity over areas presumed to be integral parts of China such as the Paracel Islands, Taiwan, and other border areas. Controlled communication by military action on territorial issues characterized Chinese behavior in both Korea in 1950–53 and on the Indian border in 1962.

(3) A tertiary policy is that of extending Chinese power and influence. Currently the PRC views its neighbors not perceived as threats more as cushions or buffers than targets. In the long run the PRC would probably like to sit at the bargaining table as equals with the United States and the Soviet Union, but they appear to be patient and realistic about attaining this Asian and global power status (Fraser, pp. 438–439.)

15. *What is the current buildup of Chinese military forces? Is their defense burden onerous? What are the economic impacts of defense expenditures?*

Even though the Soviet Union continues to refer to the Chinese economy as militarized since the break with the Soviet Union, Western analysts see a different picture with "guns" tending to lose out in recent years to "butter" or factories and farms.

China's military policy has called for large conventional forces and small but growing nuclear deterrent forces. The three-million-man ground forces—the world's largest—have been equipped and trained mainly for the military environment of the 1940's and 1950's, although an increasing proportion is being armed with more modern weapons. The air force consists largely of obsolescent short-range fighters, while naval forces have been configured primarily for coastal defense. In short, China has deployed the type of conventional forces one would expect from a developing country with a large population and a largely agricultural economy. The conventional forces stress manpower and easily manufactured weaponry in lieu of more sophisticated armaments.

China has also developed nuclear weapons for delivery by bombers and by medium- and intermediate-range ballistic missiles capable of reaching most parts of Asia. Longer range land-based missiles as well as a submarine-launched ballistic missile are probably under development, while work continues on what is apparently China's first nuclear-powered attack submarine (probably armed with conventional torpedos). The development and manufacture of these weapons, while limited in number, testifies to the mastery by the People's Republic of much of the technology of a modern industrial nation. * * *

Over the past ten years, Chinese procurement of weapons has been characterized by a generally upward trend, with two periods of rapid growth—each followed by a decline. * * *

The first growth period occurred through the mid-1960's, as China recovered from the effects of the Great Leap Forward (1958–60) and the withdrawal of the Soviet military assistance (mid-1960). Arms production had practically stopped in the early 1960s, but by the middle of the decade the output of all types of weapons had reached new peaks.

In 1966, just when armament production seemed to have recovered completely from the Leap Forward, Mao launched his Great Proletarian Cultural Revolution (1966–69). The new upheaval affected military programs in a variety of ways, even though it was not the basically economic in nature as the Leap had been.

The central authorities sought to insulate the defense industry from the disruptions of the Cultural Revolution. Nevertheless, political activity and factional conflict in the factories caused frequent disorders, occasionally of a prolonged and serious nature. Disruptions of the transportation and communication system led to delays in the delivery of raw materials, parts, and subassemblies.

A large number of leading Party and government officials were removed from office, with a resultant decline in policy initiatives. The curtailment in military production during the Cultural Revolution was not so severe or lengthy as during the Leap Forward. By the second half of 1968 the worst effects of the Cultural

Revolution on the weapons industries were over, and another period of growth in defense production had commenced. Procurement appears to have risen rapidly in the following years, with output in 1971 being more than double output in 1967.

Since 1971, military procurement has fallen substantially. This drop has extended through 1974 and apparently is continuing in the first quarter of 1975. Production and procurement of military hardware in 1972–74 has been about 25 percent lower than during the peak period of 1970–71. Much of the decline reflects a sharp curtailment of acquisitions of aircraft, but other weapons production programs have also slowed down. The broad scope and long duration of the decline suggests that it is not simply the consequence of a coincidental cutback in several weapons programs; rather, it is the result of some general cause or causes.

While the picture is not yet clear, several interrelated factors apparently are behind the decline in the production of weapons.

Because trends in weapons procurement correspond to the rise and fall of Lin Piao, political events surrounding Lin's abortive "coup" in the fall of 1971 possibly were a major factor in the decisions made in Peking. Official accounts of the coup state that military units were to have spearheaded the takeover, and it would not be surprising that the military establishment should suffer in the wake of Lin's aborted conspiracy.

China's political leadership has exhibited distrust of the military forces ever since the Lin incident. Shakeups in the military command structure have diluted the provincial civil authority of senior military leaders and may have reduced their influence on budget allocations as well. The background of this civilian-military tension lay in the Cultural Revolution when the military leaders moved—or were drawn—into the vacuum left by the fall from power of so many Party and government officials. Speeches and appointments at the Fourth National People's Congress of January 1975 may indicate that the process of restoring the more normal subordination of the military to the Party is nearly completed.

Disputes over economic priorities and budgetary allocations may in themselves have played a part in bringing the Lin crisis to a head, although direct evidence for this is thin. China's leaders may have decided that military programs were preempting an ex-orbitant amount of resources without significantly improving the country's military posture. Many of the weapons that China has been producing—such as the MIG–19 fighter—are fast becoming obsolete; additional numbers would not appreciably improve China's overall defense capability. Moreover, the Chinese policymaker must realize that the United States and the U.S.S.R. have an overwhelming superiority in both strategic and tactical arms and that even an all-out production effort by the Chinese would not redress the military balance of power for many years to come.

At the same time, Peking probably feels that it now has sufficient nuclear and conventional forces both to deter the Soviet Union from attacking with nuclear weapons and to discourage the Soviet Union or any nation from attacking with conventional forces. Furthermore, in the minds of the Chinese leaders, the threat posed by the United States has decreased as well. Thus, Peking may reason that production of some kinds of military hardware should be cut back and the resources put to other uses—certainly until later models are ready for large-scale production. Such a reallocation would not mean a reduction in Chinese forces, but rather a slower rate of military modernization.

The leadership thus may believe that in the long run a strong economy would do more to strengthen China than would a bigger military buildup at this time. * * * (Jammes, pp. 459, 462–464.)

Given the constraints presented by China's resource endowments, and present level of development, however, China's military potential and capabilities still derive from China's manpower resources. Thus, in terms of manpower alone, China's armed forces are on a par with those of the two major superpowers (the United States and the Soviet Union) and are slightly larger in size than the total armed forces in NATO. In terms of modern armaments and supporting services, such as air and naval power, however, China ranks far behind the major superpowers with annual defense expenditures less than one-fifth those in the United States and the Soviet Union and less than one-half those in the NATO countries combined. In terms of annual defense expenditures per man in the armed forces, therefore, the comparison shows an even greater gap between China and the other superpowers.

This atypical mix of manpower as against modern, sophisticated, weaponry and air and naval power explains why China has been able to provide the third largest military force in the world, even though China is an underdeveloped country. In absolute and aggregate terms, China's economy is the seventh largest in the world, but its per capita income is still less than 200 U.S. dollars. The emphasis on a manpower intensive military in a labor abundant country such as China, therefore, has only served to keep with manageable limits the economic burden of China's recognized military capabilities. Given China's desire to equip its armed forces with some modern weapons and to provide a creditable military threat by means of carefully selected modern weapon systems, however, means that the economic burden of China's defense expenditures still claims a significant share of China's production—about one-tenth of China's total GNP. To put it in the popular terminology, China's emphases on manpower in its military strategy has allowed the Chinese to obtain the biggest bang for their buck, but to obtain that bang they will have found it necessary to spend a significant share of the bucks they have available.

* * * On the margin, additional defense expenditures—especially those on military hardware—require the use of high priority inputs from other sectors where scarcities and imbalances already exist. For example, an increase in the level of defense expenditures or change in their composition in favor of more military hardware reduces the potential supply of producer's goods for civilian use, the demand for which is increasing rapidly; reduces the supply of exports and increases the demand for imports, although the Chinese balance of trade has required China to use its scarce holding of foreign exchange in recent years; and would reduce the potential standard of living of the civilian labor force which is already relatively low and the source of potential public discontent and opposition.

Thus, as China's leaders consider the various defense expenditure choice available, they obviously will be heavily influenced by the economic consequences of these choices. * * * (Dernberger, pp. 468–469.)

16. *What system of Sino-American commercial relations has been set up since the signing of the Shanghai communique? What problems and obstacles impede further development?*

In quantiative terms the People's Republic of China (PRC), despite its large size, is not a major trading nation. Chinese exports never exceed 2 percent of world exports. The ratio of total trade to China's gross national product is about 5 to 6 percent. In terms of trade per head of population, the value for China is some $14, one of the lowest in the world for any major nation. In spite of the smallness of its value, foreign trade is an important policy instrument used by the PRC for the pursuit of her overall political and economic goals. Being a state monopoly within the Chinese command economy, foreign trade has become a significant ingredient in China's development program to transform itself into a modern industrial state. Specifically, foreign trade in China has played the following roles.

Foreign trade has constituted for China an important means of facilitating and accelerating modernization. China does not have all the facilities to produce the wide variety of machinery and equipment needed for modernization. Some industrial materials were either not available in China, or available only in insufficient quantities. Foreign trade helps provide the necessary capital goods. Imports of these goods, moreover, have given China an important channel of access to modern technological know-how. The importation of specialized machineries and complete plans, some of them installed by foreign technicians, accelerate the process of technological diffusion. (Chen, pp. 617–618.)

Trade, which had been nonexistent in 1970, rose to $805.1 and $933.8 million by 1973 and 1974, respectively, with wheat sales, jet transport exports, and a number of other major contracts highlighting this unexpectedly rapid development. On the strength of Chinese purchases of American agricultural commodities, the U.S. has risen to the position of China's number two trading partner in the last two years. A degree of normalization has been returned to the Sino-American commercial relationship.

While trade has risen quickly to significant levels, while more and more American businessmen are traveling to Peking and to the Canton Trade Fair, and while Liaison Offices with commercial staffs have been opened in the respective capitals, certain unresolved issues clearly stand in the path of substantial further improvement in trading relations. * * *

Settlement of the issues of Chinese blocked assets and U.S. private claims would clear the way for further normalizaiton of commercial relations. Unresolved, these issues prevent direct shipping and direct airline connections owing to the risk of attachment of flag carriers in satisfaction of claims. Direct banking is precluded and the exchange of trade exhibitions forestalled. Another major commercial issue concerns the extension by the U.S. of most-favored nation (MFN) nondiscriminatory tariff treatment to the PRC. PRC officials have raised the MFN issue with U.S. business men and others. Presumably, Peking not only wants MFN, but feels entitled to it as part of the Shanghai commitment to conduct trade on the basis of "equality and mutual benefit." The Trade Act of 1974 provides a mechanism by which the U.S. could confer MFN status on China, but it is an Act burdened with difficult requirements where the nonmarket economies of the socialist states are concerned. * * *

The outlook for Chinese exports of the U.S. over the next several years is one of continued growth. The rate of this growth will depend on the state of the U.S. economy, on Chinese perception of this market and willingness to adapt to its demands, and on the availability in China of commodities in the requiste quantity and quality sought by Americans. Fish and shellfish showed good growth in 1974 as did tea, spices, vegetables and other food preparations. These should continue at sustained levels. Tin, tungsten, and antimony among the metals will continue to register imports of significance. Gum rosin and essential oils grew rapidly in 1974 and should continue. Textiles, clothing, bristles, feathers, and down will maintain a strong showing. Americans continue to enjoy Chinese artworks and antiques, but fireworks, a perennial leader, have declined, in part owing to problems meeting new U.S. safety standards. Petroleum exports to the U.S. do not appear to be a factor although U.S. owned oil companies may buy Chinese oil for distribution in East Asia. American importers will continue to attend the Fairs in Canton in substantial numbers.

The Chinese trade deficit with the U.S. will be sharply reduced in 1975, running perhaps $50 million. The deficit is likely to continue, its future magnitude being governed primarily by the size of Chinese agricultural purchases in the United States. (Clarke and Avery, pp. 501, 502, 530, 531.)

The prospects of a trade agreement between the United States and the People's Republic of China has, since the Shanghai Communique, offered the possibility of marked forward motion in the relations between the two countries. It assumes substantial importance for both sides in light of the passage of the Trade Act of 1974 in the closing days of the 93rd Congress. Under the Act, Public Law 93–618, signed by the President on January 3, 1975, the authority to lower tariffs on imports from China has shifted from Congress to the Executive. There are limitations on the authority of the President to grant most-favored-nation tariff treatment to China, to be sure, but the negotiating authority now is there, and there is no good reason not to proceed with all deliberate speed to trade negotiations with Peking.

The threshold question, of course, is whether or not the United States should contemplate a trade agreement with a country to which it has not accorded diplomatic recognition. Precedent for such an agreement under international law, if such were needed, lies in a trade agreement entered into between Great Britain and the Soviet Union in 1921, a step which preceded formal diplomatic relations. The same question may be raised in Peking, although the Chinese have previously concluded trade agreements in the absence of diplomatic ties. While the two sides will have to examine whether on pragmatic grounds, a trade agreement should precede or follow the establishment of full diplomatic relations, trade negotiations toward such an agreement can certainly begin prior to fully normalized political relations. * * *

* * * To sustain and build toward the modern industralized state, to which the Chinese pledged themselves at the Fourth National People's Congress, does require acquisition of foreign goods and technologies. Purchases of needed imports in turn requires more than a little contact with the West. Not all such contact is likely to be palatable to a political leadership which is bound to fear that revolutionary values may wane in the process. The post-Mao, post-Chou period cannot be far away, and succeeding leadership is certain to be preoccupied with political consolidation, preserving revolutionary fervor and maintaining the monumental accomplishments of the old leadership. This process can obviously sharply influence China's trade and development policies. But Peking's 1975 pledge to achieve "comprehensive modernization * * * before the end of the century" should be signal enough that China's foreign trade ought to hold interest for American firms. (Theroux, pp. 582, 583, 595, 596.)

17. How flexible has the PRC been in external transactions in adapting to international practices?

China's practices in financing trade with non-Communist countries are in substantial contrast to those of the other Centrally Planned Economies (CPEs).

Despite the fact that the PRC has a greater share of its trade with the west than other CPEs, the PRC has been more reluctant to adopt as many western banking practices as the other CPEs. Many of the practices that have been adopted have been modified with the general result that the PRC maintains somewhat more control over its international finance with the west than other CPEs do. Examples of this range from requiring negotiation of letters of credit in China both for exports and imports to using the Renminbi to denominate trade contracts.

Most importantly, the PRC has, as yet, been unwilling to follow other CPEs in adopting western banking techniques such as setting up European branches to engage in archetypical banking activities such as general trade financing and active participation on the Euro-currency market.

On the other hand, PRC international financial practices have changed significantly in the last few years—generally in the direction of adopting more traditional practices. The Chinese foreign trade corporations (FTCs) have been more flexible on various letter of credit provisions and they have become more willing to denominate trade contracts in western currencies. Most important of all, of course, the PRC has begun to accept credit, albeit in moderation and often indirectly. (Denny, p. 676.)

18. Is Japan likely to continue to develop a special commercial relationship with PRC?

Japan has become the People's Republic of China's leading trade partner, accounting for about 20 percent of the PRC's foreign trade turnover in recent years. A unique set of economic and political factors has facilitated a rapid expansion of Sino-Japanese trade in the 1960's and 1970's. First, there is a substantial degree of complementarity between the two economies. Japan is heavily dependent on imports of raw materials to fuel its modern industrial economy, and Japanese industrial leaders consider the PRC a logical supplier of some of their needs. At the same time, foreign trade planners in the PRC have placed a high priority on imports of the kinds of machinery and equipment and industrial manufactures which Japan has the capacity to export. The short, relatively cheap water transport between Japan and China makes the trading relationship especially attractive for exchange of goods in which transport costs represent a large share of the final price. Long water and rail transport to alternative markets in Western Europe and North America involve substantially higher transport costs. Their economic complementarity and their geographic proximity create an opportunity for a substantial trade turnover benefiting both countries. The foreign trade potential of certain key industrial sectors which are examined in this paper will be a key determinant of the volume of future Sino-Japanese trade.

Another key determinant of the level of Sino-Japanese trade is the political relationship between the two governments. To a much greater degree than other countries, the PRC's foreign trade has been shaped by its general foreign policy objectives. Consequently, Sino-Japanese commercial relations have been linked to the diplomatic interactions of the four great powers in Asia—the PRC, Japan, the Soviet Union, and the United States. (Kim, p. 600.)

19. How have the Chinese perceived their need for foreign technology? How effectively do the Chinese diffuse technology transferred from the West?

The People's Republic of China has exhibited wide swings in its receptivity to foreign technology in the course of its 25-year history, oscillating between enthusiastic acceptance and determined rejection. In the 1950's—the era of close Sino-Soviet Cooperation—China eagerly accepted what was undoubtedly the most comprehensive technology transfer in modern history. During that decade the Chinese obtained from the Soviet Union the foundation of a modern industrial system. In the process, however, the Chinese became heavily dependent on Soviet tutelage and were induced to adopt a Soviet model of forced industrialization inappropriate to China's resource endowment. In the late 1950's, the

Chinese leaders began to reject this model and the overwhelming Soviet influence. The Great Leap Forward marked the reaffirmation of a more traditional Chinese nativism and self-assertion. Foreign technology and expertise were rebuffed and a policy of self-reliance instituted. Inept policies, successive crop failures, and the sudden withdrawal of Soviet technicians in 1960 combined to throw the Chinese economy into disarray.

A shift in the early sixties toward priority for agriculture and a return to a more permissive technology-import policy helped to revive the economy. While continuing to stress self-reliance, the leadership undertook selective purchases of European and Japanese plants and equipment, primarily as prototypes for learning and copying. By 1965, the economy had largely recovered from its earlier setbacks, only to be disrupted once more by the turmoil of the Cultural Revolution. The intense antiforeign campaign of that period again sharply curtailed acquisition of foreign technology, and by 1969 machinery imports had dropped to less than one-fourth of the peak levels attained ten years earlier.

Since 1970, the Chinese leaders have turned outward once again for the acquisition of capital equipment and know-how on a substantial scale. No longer confining themselves to prototypes, the Chinese have purchased large numbers of complete plants and industrial complexes to enhance output in a half-dozen basic industries, primarily metallurgy, petrochemicals, and energy. Machinery imports, therefore, have risen more rapidly in recent years than during any previous period.

Self-reliance continues to be stressed, nevertheless, with at least three objects in view: (1) to minimize China's strategic and financial dependence on foreign countries; (2) to create a self-confident "new Maoist man" and guard against his contamination by alien influences; and (3) to mobilize local savings so as to economize scarce foreign exchange and state investment outlays. The pursuit of self-reliance in these terms has enabled the Chinese to achieve a high degree of technical and economic independence of the outside world. China's own production of machinery and equipment is now so large that imported technology represents only a small fraction (perhaps 6 to 8 percent) of its overall technology accretion. In qualitative terms, however, technology imports are still a key factor in the development of the more sophisticated sectors of China's industrial production system. (Heymann, pp. 678–679.)

20. *What is the scope, effectiveness and burden to the PRC of its economic relations with the Third World?*

After the disruptions of the Cultural Revolution, the People's Republic of China reappeared on the international scene in 1970, with renewed determination to assert itself as a major world power. It sought to gain wider international acceptance by becoming a responsible spokesman for the Third World. In assuming its new leadership role, China deemphasized its former activist policy of promoting radical change and upsetting established governments. Economic and military assistance and trade have thus risen in importance as instruments of policy toward the less developed countries (LDCs). At the same time that its own position in the LDCs was being strengthened, Peking sought to reduce Soviet and Western influence in the Third World.

In the past five years, 1970–74, China has boosted its economic aid commitments to the LDCs by $2.4 billion, more than double the $1.1 billion extended in the previous 14 years, 1956–69. Nearly two-thirds of the aid in the 1970s went to Africa. The single most important Chinese aid project is the almost completed Tan-Zam Railroad, into which Peking has poured an average of almost $100 million annually beginning in 1970.

The revitalization of China's relations with the LDCs has also found expression in stepped-up military aid. In the last five years, the People's Republic has furnished the developing countries a total of $300 million in military assistance compared with only $250 million previously. About three-fourths of Peking's military aid to LDCs has gone to Pakistan.

As for trade, the LDCs have become large markets for Chinese rice, iron and steel, and textiles, as well as important sources of supply for rubber, cotton, and nonferrous metals. In addition, the LDCs of East Asia are a major source of hard currency for the People's Republic. Chinese exports to the LDCs were about $1.4 billion in 1974, imports $900 million. (Fogarty, p. 730.)

Prospects and Problems

This volume on the economy of the People's Republic of China may be significantly more useful to American policymakers, scholars and the general public for several reasons:

1. The rapprochement between the United States and the People's Republic of China has been followed by increasing political, commercial, social and other relations. Commercial relations have expanded due to increased needs for Western technology—including modern fertilizer plants to increase agricultural output. Expanding oil revenues and a more flexible attitude toward credit and other aspects of the Western market suggest wider future commercial ties.

2. The leaders of the PRC have given priority to improved economic performance. A recent reduction in weapons procurement may indicate a preference for current economic performance over arms production, especially of obsolete hardware. In spite of possible progress on birth control, the Malthusian specter still looms in China's future. Imports of grain and transfer of agricultural technology from the West, though marginally significant in the short run, do not shift the heavy long-term subsistence burden on Chinese agriculture.

3. Modest, but significant, improvements in published economic data, empirical evidence from exchanges, and more attention to accurate reporting have aided the Western analyst in appraising China's economic policy and performance.

It is difficult to separate elements of long-term trends from cyclical or variable factors in performance. However, it seems clear after quarter of a century of power that Chinese leaders aim to develop a modern, powerful, industrial state capable of joining the superpowers on equal terms and providing adequately for its citizens' needs. There is not, however, in the current Chinese development the Stalinist urgency to overtake and surpass in a short, definite time period—a goal they expressed during the Great Leap.

Against this long-term aim of achieving an economic basis for superpower status, there appear to be political, ideological, and social policies which from time to time override the short-term progress of nation-building. Some of them may take on importance in the years immediately ahead and influence economic performance:

Political succession.—Inevitably Chairman Mao and Chou En-lai must physically pass from the scene with the old revolutionary leadership. Possibly the recent Party Congress prepared the nation for the post-Mao-Chou period. Successions elsewhere; for example, after Lenin and Stalin, suggest that unforeseen, unsettling struggle is more likely than an orderly transfer of power.

Ideological revitalization.—There have been times; for example, in the Great Leap Forward and Cultural Revolution periods when the requirement for ideological revitalization conflicted with policies for economic performance. Likewise, there may be a case for arguing a past cyclical pattern of policy preference for each. If this be the case, stable long-term-growth prospects may be in jeopardy.

Foreign threats or opportunity requiring more weapons and military forces.—Concern with the Soviet Union may at any time lead to a shift in Chinese weapons or force buildup. Opportunities for supporting Asian Communist power; for example, North Korea or in

South East Asia, cannot be ruled out in the future even though present indications suggest Chinese restraint.

Indeed, some would argue that these represent central, fundamental forces in Chinese society and that economic considerations are the external or variable factors. Whatever the primary and secondary forces are in Chinese development, it has become clearer in each successive economic assessment that the PRC economy has attained a firmer base for claims of meeting not only domestic but the major international goals of the leadership. In spite of many current and likely future problems, we should not assume that the People's Republic of China will not be able to meet its priority economic needs.

Part I. POLICY ASSESSMENTS AND PERFORMANCE

CHINA: ECONOMIC OVERVIEW, 1975

By ARTHUR G. ASHBROOK, JR.

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APPENDIXES

TABLES

FIGURES

I. KEY FINDINGS

1. As of early 1975, the economy of the People's Republic of China has proved an effective mechanism for supplying the minimum needs of the population, modernizing the industrial sector, and supporting a formidable defense establishment.

2. Premier Chou En-lai, in his speech to the Fourth National People's Congress in January 1975, has signaled the continuation of the drive for higher output and technological self-sufficiency in a comparatively moderate political atmosphere.

3. The ordering of 13 large chemical fertilizer plants from the West has given China the possibility of moving to a higher plateau in agriculture, starting about 1980.

4. At the same time, a substantial new burst of investment in coal, steel, and other basic branches has become necessary to maintain industrial growth rates.

5. The annual rate of production and procurement of military hardware in 1972–74 has been about 25 percent below the peak rate of 1970–71, probably the combined result of the priority of agriculture-support programs, the changeover to later model weapons, and the reassertion of Party control over the military.

6. Rising domestic output of crude oil and soaring international oil prices have enabled petroleum to take up the slack in earnings from traditional exports.

7. The third, and most serious, of the population control programs probably has not yet had a substantial impact on demographic rates.

8. If the government wishes to give the highest priority to a sharp curbing of population growth, it has at hand the bureaucratic and the scientific/technical resources to do the job.

9. With its floor under consumption, its purposeful investment program, its control over migration to urban areas, and its hard-driving leadership, China has easily outdistanced other large LDCs.

10. While the PRC has not narrowed the technological gap between itself and the leading industrial nations, it has been spared their tribulations with recession, inflation, and energy shortages.

11. Only a cataclysmic political upheaval—following the fading away of Chairman Mao and Premier Chou—could reverse the technocratic tendencies now deeply rooted in Chinese economic society.

12. At the same time, the examples of great political flareups in the past should caution the observer against any straight-line projection of steady economic growth.

13. Outside of political upheavals, the main challenges to the Chinese economy over the next 25 years will be to incorporate a more complex mix of products into the system, to maintain a spirit of hard work and sacrifice in a generation with no memory of national or personal humilitation, and to keep the lid on consumption in an era of universal education and advancing technology.

II. Introduction: Organization of the Paper

This paper appraises the economy of the People's Republic of China from the vantage point of early 1975. The discussion focuses on developments since the Cultural Revolution of 1966–69, dealing mainly with the transitional year 1970 and the first 4 years of the Fourth Five-Year Plan (1971–75).[1] Two tables provides a quick summary of the entire quarter of a century since the formation of the People's Republic. Table 1 sets forth in capsule fashion the economic results for major economic sectors in each of six distinctive economic periods. Table 2 presents 10 basic economic time series, 1949–74.

[1] For a systematic description of major developments in the years before 1970, see the author's paper in the previous JEC volume on the Chinese economy: Arthur G. Ashbrook, Jr., "China: Economic Policy and Economic Results, 1949–71," *People's Republic of China: An Economic Assessment*, Joint Economic Committee of the U.S. Congress, Washington, 1972, pp. 3–51. The volume is cited hereafter in this present paper as "JEC-72" and the paper as "Ashbrook, JEC–72." Tables 1 and 2 in this paper are updated versions of Tables 2 and 3 in the earlier paper.

TABLE 1.—CHINA: ECONOMIC RESULTS, 1949–74

Period	Overall results	Industrial results	Agricultural results	Foreign trade results	Consumer welfare results
1949–52, Rehabilitation	Return to pre-Communist level of economic activity.	Reactivation of capacity as flow of raw materials resumes.	Return of fields to operation and distribution of land to peasants.	Imposition of strict government control and switch to Communist partners.	End of civil war, inflation, gross starvation; hope rekindled.
1953–57, 1st 5-year Plan	Successful build-up of industrial base under Soviet auspices.	Increased capacity and output of steel and other basic products.	Gains in output from own resources; collectivization in stages.	Growing volume, with basic products being exchanged for Soviet machinery.	Stabilization of living standards at spartan but improved levels.
1958–60, Great Leap Forward	Disastrous overstraining of the economy's resources.	Ruinous increase in tempo and deterioration of quality.	Precipitous fall in output due to bad weather and ill-fated communes.	Sharp spurt, then downturn caused by domestic problems.	Near starvation and collapse of morale when leap fails.
1961–65, Readjustment and Recovery.	Quick and successful recovery of economic balance.	Rationalization of output, with investment in priority branches.	Quick return to growth pattern with aid of new inputs.	Dramatic shift to Japan and Western Europe, with rising volume.	Restoration of living standards at spartan levels.
1966–69, Cultural Revolution	Short-lived break in economic momentum.	Sharp dip in industrial output with investment continuing.	Continued growth on basis of good weather and larger inputs.	Temporary dip because of domestic dislocations.	Maintenance of living standards in spite of political turmoil.
1970–74, Resumption of Regular Planning.	Resumption of economic growth across the board.	Gains in capacity and output, with oil a star performer; coal shortages.	Continued growth on basis of good weather and larger inputs.	Resumption of growth in line with domestic economic gains; use of credit.	Gradual improvement in living standards.

TABLE 2.—CHINA: MAJOR ECONOMIC INDICATORS, 1949–74[1]

Period and year	GNP (billions of 1973 dollars)	Population midyear (millions)	GNP per capita (1973 dollars)	Industrial production (1957=100)	Agricultural production (1957=100)	Steel output (millions of metric tons)	Grain output (millions of metric tons)	Foreign trade: Exports f.o.b. (billions of current dollars)	Foreign trade: Imports c.i.f. (billions of current dollars)	Foreign trade: Percent trade with Communist countries
1949–52, Rehabilitation:										
1949	40	538	74	20	54	0.16	108	0.43	0.40	(²)
1950	49	547	89	27	64	.61	125	.62	.59	29
1951	56	558	101	38	71	.90	135	.78	1.12	51
1952	67	570	117	48	83	1.35	154	.88	1.02	70
1953–57, 1st 5-year Plan:										
1953	71	583	122	61	83	1.77	157	1.04	1.26	68
1954	75	596	125	70	84	2.22	160	1.06	1.29	74
1955	82	611	134	73	94	2.85	175	1.38	1.66	74
1956	88	626	141	88	97	4.46	182	1.64	1.48	66
1957	94	641	147	100	100	5.35	185	1.62	1.44	64
1958–60, Great Leap Forward:										
1958	113	657	172	145	108	11.08	200	1.94	1.82	63
1959	107	672	160	177	83	13.35	165	2.23	2.06	69
1960	106	685	155	184	78	18.67	160	1.96	2.03	66
1961–65, Readjustment and Recovery:										
1961	82	695	118	108	77	8	160	1.53	1.50	56
1962	93	704	133	114	92	8	180	1.52	1.15	53
1963	103	716	144	137	96	9	185	1.57	1.20	45
1964	117	731	160	163	106	10.8	195	1.75	1.47	34
1965	134	747	179	199	114	12.5	210	2.04	1.84	30
1966–69, Cultural Revolution:										
1966	145	763	190	231	116	15	215	2.21	2.04	26
1967	141	780	180	202	123	12	230	1.94	1.95	21
1968	142	798	178	222	116	14	215	1.94	1.82	22
1969	157	817	192	265	118	16	220	2.03	1.83	20
1970–74, Resumption of Regular Planning:										
1970	179	837	214	313	129	17.8	240	2.05	2.24	20
1971	190	857	222	341	134	21	246	2.42	2.30	23
1972	197	878	225	371	130	23	240	3.08	2.84	22
1973	217	899	241	416	138	25.5	250	4.90	4.98	17
1974 preliminary	223	920	243	432	141	23.8	255	5.90	6.70	15

[1] Note that GNP in this table is presented in 1973 U.S. dollars whereas foreign trade is presented in current U.S. dollars. For details on the calculation of GNP, see app. A. For a discussion of general sources on which this table is based, see app. B.

[2] Negligible.

The paper begins with a series of key findings. The text continues with a brief review of long-term economic forces at work in early 1975, an assessment of current policy and planning issues, and a discussion of major developments in agriculture, industry, foreign trade, and transportation. Then comes an analysis of trends in consumption, the possibility of effective population control, the reforms of education, and the prospects for future economic advances.

Three appendixes describe the computation of the GNP figures used in the text, the sources of information available on the Chinese economy, and the nature of the Chinese economic system as a variant of the Soviet economic model.

III. Background: Long-Term Economic Forces

At the beginning of 1975, the final year of the Fourth Five-Year Plan, the Chinese economy reflects the experience of a quarter of a century of development under Communist rule. Estimated long-term annual economic growth rates have been as follows, calculated on the base years 1952 and 1957:

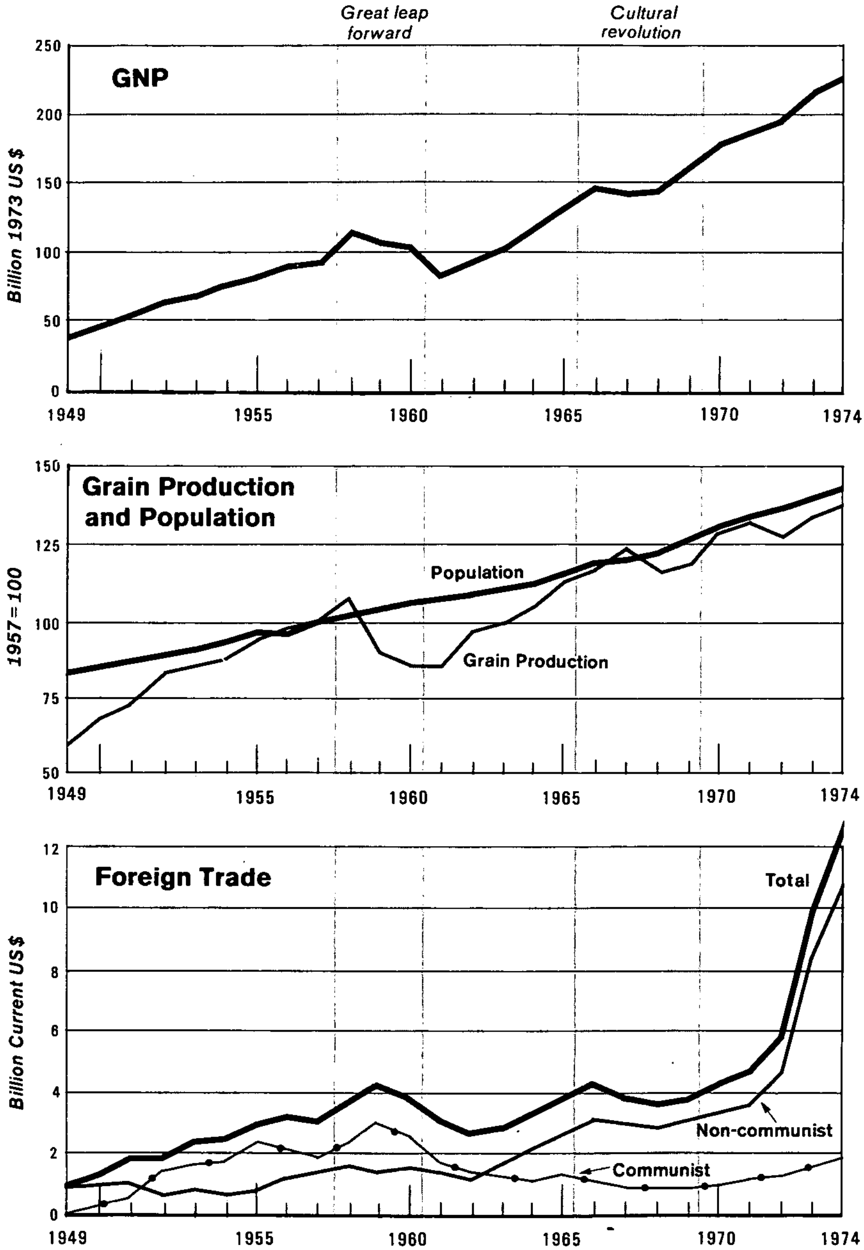
[In percent]

Item	1953–74	1958–74
GNP	5.6	5.2
Agricultural production	2.4	2.0
Industrial production	10.5	9.0
Population	2.2	2.1
GNP per capita	3.4	3.0

The short-term rate of growth of GNP has been erratic, mainly because of the two major political upheavals—the Great Leap Forward (1958–60) and the Cultural Revolution (1966–69). As depicted in the first section of figure 1, GNP plunged in the aftermath of the ill-fated Leap Forward and dipped, less severely, when the Cultural Revolution interrupted industrial production.

CHINA: Basic Economic Trends

Figure 1



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The composition of GNP growth mirrors the economic priorities of the Communist leadership. Once a reasonable amount of food has been provided to maintain the morale and productive vigor of the population, the energies of the economy are to go to the expansion of industrial capacity and output. Thus agricultural production has been advancing over the long run at 2 percent in line with population growth, while industrial production has been growing at 9 percent, on the 1957 base. As shown in the second section of figure 1, population has moved steadily upward whereas grain production has fluctuated widely. In particular, in what Peking labels "the 3 disaster years" of 1959–61, grain output dropped by one-fifth through a combination of manmade and natural disasters. Beginning in 1961, the PRC has imported several million tons of grain annually to supplement domestic production.

In addition to consumption and investment, a third major charge against national output is defense. Manpower requirements for defense represent a negligible net drain on resources since (a) only 1 out of 10 males in each age class is selected for service, and (b) the People's Liberation Army grows much of its food, furnishes a great deal of manpower to the civilian economy at harvest time, and supports major construction projects. Military requirements levied on heavy industrial and technological resources, while considerable, have been moderate enough to permit substantial growth in general industrial capacity.[2] In the current 5-year plan period, China has moved into the production of aircraft, submarines, missiles, and other weapons of its own design. Yet its military establishment remains strongest in its tough, frugally maintained ground forces, which give it a formidable capacity for in-depth defense of its territory.

Foreign trade is small compared with domestic production, exports being equal to less than 3 percent of GNP. China is a huge continental nation with the domestic potential for practically all kinds of agricultural and industrial output and with often stated aspirations for economic self-sufficiency. Trade is viewed as a temporary vehicle for obtaining foreign machinery, technology, and grain. The leadership of the PRC—which remembers its experience of the 1950's when it relied so heavily on a single source, the U.S.S.R.—now spreads its orders for modern equipment among several Western suppliers and Japan; and China is rapidly widening its own competence in machine building. The third section of figure 1 shows the switch in trading partners made after the collapse of the Leap Forward and the withdrawal of the Soviet technicians. Whereas the PRC conducted two-thirds of its trade with other Communist countries in the late 1950's, it now conducts four-fifths of its trade with non-Communist countries. As part of its commitment to economic self-sufficiency, the People's Republic has kept internal and external debt to a minimum, In 1973–74, Peking chose to relax this policy and began to arrange for deferred payments on a portion of its imports of machinery.

To summarize these background elements: as of early 1975, the Chinese economy has been shaped by the working out of four interdependent long-term factors:

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[2] For a discussion of military-economic issues in the People's Republic of China, see the paper by Sydney H. Jammes in this volume.

GNP growth that has provided a substantial margin over subsistence for use in building up the capacity of the economy and maintaining a formidable military defense;

Agricultural growth that, supplemented by comparatively small imports, has sufficed to feed the expanding population;

Industrial growth that, starting from a small base, has provided rapid increases in capacity and output of industrial materials, machinery, and military equipment; and

Foreign trade growth that for more than a decade has been geared to acquiring advanced industrial equipment, industrial materials, fertilizer, and grain from non-Communist trading partners.

IV. Planning: Moderation in Vogue

The economic planning system. which had been partly paralyzed during the Cultural Revolution (1966–69), recovered much of its forcefulness in 1970–72, only to be subject to new political buffeting in 1973–74.

During the Cultural Revolution, a large slice of the ranking Party and government leaders had lost their jobs. Heads of economic ministries and planning agencies dropped from sight; in many cases their posts were not officially filled until January 1975. Farther down the hierarchy, the disruptions of the Cultural Revolution were mild except in a few riot-torn cities like Wu-chou near the Kwangsi/Kwangtung border. In most areas for most of the period, the day-to-day activities of the economy—the collection and distribution of grain, the operation of factories and communes, and the carrying out of financial transactions—continued undisturbed on the basis of institutional roots established over the first 17 years of Communist rule.

After the Cultural Revolution had subsided, economic policy initiatives became possible at the top:

In the fall of 1970, Premier Chou En-lai announced that a Fourth Five-Year Plan for 1971–75 had been drafted.

Formerly discredited bureaucrats began to reappear, most notably the deposed Party Secretary Teng Hsiao-ping;

In 1972–73, agreement was reached within the top leadership on important changes in long-term strategy in agriculture and industry, as discussed below.

In mid-1973, new political ferment began to revive questions about the balance in the continuing radical-versus-moderate confrontation. During the course of the "anti-Confucius, anti-Lin Piao" campaign, attacks were launched against reliance on material incentives, foreign technology, and the leadership of rehabilitated bureaucrats. In the first half of 1974, the political turbulence began to interfere with the rhythm of production, leading to quarrels over incentive systems, scattered slowdowns and stoppages in the factories, and interruptions to rail traffic. Additional questions about the political future came to the fore in early May 1974 when Premier Chou En-lai reduced his grueling workpace because of advancing years and growing physical ailments. In the second half of 1974, however, the official press began to beat the drums for production, and the interruptions to production died down. Chou continued to orchestrate the nation's business from his hospital room. The restoration of a moderate policy was dramatically underscored when Chou was reconfirmed as premier by the Fourth National People's Congress in January 1975. His "state of the union" address at the Congress, while paying due respect to the necessity for continued revolution, stressed increased output and improved technology. Simultaneously, articles in the press noted the importance of labor discipline and the necessity of harder work without additional remuneration.

In the second half of 1974, Chairman Mao, the unique fount of inspiration and authority, had added to the uncertainty about national policy by disappearing from Peking, apparently staying in his native province of Hunan. His failure to attend the January National People's Congress suggests to some observers that differences exist between him and some of the other Chinese leaders on important issues.

While more than pinpricks, the difficulties of the first half of 1974 did not change the general course of the economy and its overall prospects for growth.

The planning and statistical systems in early 1975 have recovered from the battering sustained during the Cultural Revolution. The cycle of planning, including the succession of plan drafts and the bargaining back and forth between government levels, goes on in regular fashion. Statistics on planned and actual production, consumption, and stocks and on financial flows move up and down the line. The 15-year statistical blackout continues, however, with Peking publishing only a few national and provincial statistics and confining most of those to percentages rather than absolute values.[3]

The political turbulence at the center in 1973–74 increased the importance of provincial and subprovincial organizations in the direction of the economy. This is an advantage to the economy as long as the momentum of established policy carries the economy in the right direction. It is further an advantage, certainly for the short run, when the policy initiatives at the center turn out to be impractical innovations from the radical end of the political spectrum. Part of Chou's purpose in his report at the National People's Congress was to reassert central control over economic planning as well as a tightening of central management of economic affairs.

In the meantime, the lower-level cadres and the rank-and-file peasant, worker, and professional want to settle down. They must be weary of political indoctrination meetings and petty interruptions of the hard daily task of making a living. They look forward to gains in consumption and to opportunities for advancement on the job. The implicit affirmation in early 1975 of moderation in economic policy will be welcome down the line.

V. Agriculture: Groundwork for Breakthrough

The agricultural sector is entering the third stage of its development since the Communists came to power. In the 1950's, when the Soviets were the economic mentors of the People's Republic, the agricultural sector was left largely dependent on its own material resources. Tight control over production and distribution of agricultural output, collectivization of the countryside, and use of rural labor to improve the soil and build water control facilities were counted upon to provide

[3] For a review of the current statistical situation, see Appendix B.

(a) needed food, (b) raw materials for industry, and (c) export products to be exchanged for machinery and industrial materials. This initial strategy became bankrupt in the Leap Forward when the leadership established the unwieldly supercollectives (the communes), abolished the private plots, and wasted vast resources on ill-conceived programs.

After having taken emergency measures to bring China back from the verge of mass starvation and political disintegration, the leadership in 1962 adopted a new agricultural policy—the provision of substantial and growing support from the modern industrial sector. For more than a decade now, a mounting volume of chemical fertilizer, pesticides, irrigation equipment, tractors, and improved seeds has been flowing to the agricultural sector. This support has been supplemented by the output of a host of small industrial plants established in outlying areas.

In 1972, in a third great policy decision, the leadership embarked on a long-term agricultural improvement program to free China of the necessity of importing grain and chemical fertilizers. Between November 1972 and May 1974, Peking contracted for 13 large urea plants from Japanese, West European, and United States sources at a total cost of $500 million. Output from these plants, if expeditiously supplemented by improved water control facilities and increased supplies of other types of fertilizer, will boost agricultural output to a new higher plateau by 1980. Production of grain in 1980 could be as much as 30 percent above the 1974 level; the need for imports of grain and nitrogen fertilizers could be eliminated, even in poor crop years.

In the meantime, Peking must continue to import sizable quantities of grain. In 1972, grain imports were 4.8 million tons and in 1973, a record 7.7 million tons. Purchases in 1974, originally scheduled at more than 9 million tons, fell off to 7 million tons, distributed as follows:

[In millions of metric tons]

Source	Wheat	Corn	Total
Total	5.65	1.36	7.01
United States	2.01	.77	2.78
Canada	1.90	0	1.90
Australia	1.39	0	1.39
Argentina	.14	.59	.73
France	.21	0	.21

The grain crop in 1974 was above the 250 million tons of 1973 and may have been as much as 260 million tons. A figure of 255 million tons is carried in the statistical tables in this paper. Weather was average to somewhat below average in both 1973 and 1974. The continued increase in the effectiveness of the water control system and the general increase in inputs into agriculture constitute the key elements in the long-term upward trend in farm output. Results for 1974, as for 1973, can be viewed as falling approximately on the long-run agricultural growth curve with its 2 percent rate of climb.

Improvements in flood control and irrigation facilities continue to yield substantial returns in output in some areas, because many water control projects are only partly finished and major rivers and large tributaries remain to be harnessed. In addition to the improvement of yields on existing acreage, new acreage is being reclaimed from the hillsides, the desert, and even the sea. At the same time, farmland is being taken for factories, urban housing, and military installations. We have no data to determine the extent to which the forces affecting total cultivated acreage are offsetting. In any case, the net change from year to year is small. As for seeds, China is gradually taking advantage of the opportunities for combining improved seeds with advances in fertilization and water control.

The availability of seasoned manpower is another plus factor in agriculture. Numbers are no problem, of course; indeed, average output would rise markedly if China had a more favorable labor/land ratio. The issues have been the level of skill, the distribution among various rural tasks, and motivation:

Agriculture is benefiting from the broadening of education and training in rural areas, the increased experience of the work force with fertilizers and machinery, and the assignment to the countryside since 1968 of nearly 10 million middle-school graduates from urban areas.

The leadership is taking a moderate approach toward the distribution of rural labor, giving production brigades and teams leeway to adjust to local conditions. According to guidelines sent down from the top, the program for small industrial plants and mines must not be pushed too far; they should not absorb more than 5 percent of the labor force of any county.

Motivation presumably is being helped by improvements in rural living standards, including better housing, health care, and educational facilities. Also important has been the pragmatic attitude taken by the Government toward the private plots and petty private trade. Serious disaffection apparently is confined to youth, especially the city youth transferred to the countryside for rural labor.

VI. Industry: Further Support of Agriculture

The course of industrial development over the past 5 years has been dominated by three themes—the narrowing of the gap between output and available capacity, the even greater emphasis on agriculture-support activity, and a sharp rise, followed by a substantial decline, in output of the defense sector. In 1969, when the Cultural Revolution was winding down, China's industrial capacity was considerably larger than actual industrial output. The gap between capacity and output was the result of (a) the downturn in output caused during the Cultural Revolution by dislocations in industrial planning and management, interruptions in raw material supply, and factionalism within factories, and (b) the considerable additions made to productive capacity during these turbulent years. Even though the Cultural Revolution slowed down output of construction materials and sometimes delayed work at construction sites, the fact remains that these represented only partial setbacks in a huge investment effort.

The process of putting the extra capacity to work got underway in

1969, when production rebounded from the 1967–68 trough. The next year, 1970, also saw a sizable rise in output, with growth over the next 4 years dropping back toward the less spectacular—but still quite respectable—growth rate of about 8 to 9 percent. Estimated year-by-year increases in industrial output are:

	Percent		Percent
1969	19	1972	9
1970	18	1973	12
1971	9	1974	4

The shift in economic strategy of the past 2 years—in which the groundwork for a long-term breakthrough in agriculture is being laid—has important implications for the course of industrial development. Much of the tremendous increase in the contracts for Western industrial plants ($1.2 billion in contracts in 1973 and another $850 million in 1974, compared with only $60 million in 1972) is not designed to increase the machine-building or mining capacity of the PRC but rather to expand severalfold the capacity to produce chemical fertilizer and artificial fibers. The pressures in 1974 on supplies of coal and electric power are the result of the failure to open large new coal mines in recent years. The attempt to raise population from existing mines by more intensive application of labor has increasingly run into diminishing returns. The skimping on investment in new capacity is tied implicity to the priority of investment in industrial branches that directly support agriculture.

Production and procurement of military hardware in 1974 continued at the same general level as in 1972–73, or at approximately 25 percent below the peak level of 1970–71. Although the explanation for curtailed military production is not clear, it probably stems from a combination of: The priority accorded the "agriculture first" policy, the cutting back of production of certain types of naval vessels and obsolescent aircraft while new models are being readied, and the decline of the political strength of the military since Lin Piao's abortive coup in the fall of 1971.

A striking feature of the industrial scene at the start of 1975 is the small plants program, which has received new emphasis in the last several years. In Chinese discussions of the program, the term "small plants" refers to enterprises distinguished by (a) simply technology, (b) location in rural areas, (c) production in direct or indirect support of agriculture, (d) dependence on local labor and raw materials, and (e) local (usually subprovincial) administration. The program—as table 3 indicates—is broadening the base of important industrial branches. The cost in resources is small compared with the benefits. The program makes maximum use of local labor, materials, and transport, whose contribution in other uses generally would be much less valuable.

Difficulties with the small plants program in the past have come mainly from overzealous implementation during periods of political upheaval. The anti-Confucius campaign has not resulted in any hurried expansion of the program.

TABLE 3.—*China: Contribution of small plants to industrial output*

Agricultural machinery	Almost all the simple farm tools and a substantial portion of basic farm machinery.
Chemical fertilizers	More than 50 percent of nitrogen fertilizer output (by weight) and 75 percent of phosphate fertilizer output (by weight); of major importance to the maintenance of growth of agricultural output, even if not top quality.
Cement	50 percent of national output; sufficient in quantity and quality for practically all local needs.
Hydroelectric power	About 5 percent of national electric power capacity and a large part of rural needs, especially for irrigation.
Coal	30 percent of national output; used mostly for local industry, cooking, and heating.
Iron and steel	20 percent and 15 percent, respectively, of national output; used in rural industry and construction.

Because the industrial sector has been pressing against supplies of fuels and raw materials, expansion of the small plants program is now proceeding at a conservative pace. Furthermore, the subsiding of pressure from radical political elements in the last half of 1974 has increased the chances for continued moderation in the program.

Another striking feature of the industrial scene is the great percentage increase in oil output from its small beginnings in the 1950's and early 1960's. Production of crude oil has advanced as follows:

	Million metric tons	Thousand barrels per day		Million metric tons	Thousand barrels per day
1957	1.46	29	1971	36.7	734
1960	5.5	110	1972	43.0	860
1965	10.8	216	1973	54.5	1,090
1970	28.5	570	1974	65.3	1,310

In the steel industry, production of finished products has lagged behind the growth of domestic requirements. Furthermore, production of crude steel in 1974 is estimated to have fallen back to 24 million tons from 26 million in 1973 because of shortages of raw materials and, perhaps, labor unrest. Imports of finished steel rose to 4 million tons in 1974; and imports of iron ore, pig iron, and steel scrap continued to rise. After several years of tough negotiations, China signed contracts with Japanese and West German consortiums, for a $430 million sheet steel rolling and finishing mill to be built at Wu-han. The new facility, when commissioned in 1977, will boost annual production of finished steel by more than 3 million tons, still short of Chinese needs.

VII. FOREIGN TRADE: OFF THE CHART

Until 1971, the value of China's foreign trade never rose above the 1959 peak. Then, because of a renewed Chinese interest in foreign goods, but also because of revaluations of world currencies and worldwide inflation, the dollar figures began to zoom upward—reaching $12.6 billion in 1974. In 1973, somewhat more than half of the 67 percent rise was attributable to monetary factors, somewhat less than half to the rise in physical volume. In 1974, almost all of the 28-percent rise was attributable to the monetary factors. The sharp upward trend is shown by the tabulation:

[In billions of U.S. dollars]

	Total trade	Exports f.o.b.	Imports c.i.f.
1970	4.29	2.05	2.24
1971	4.72	2.42	2.30
1972	5.92	3.08	2.84
1973	9.88	4.90	4.98
1974	[1] 12.60	5.90	6.70

[1] Preliminary.

Specific features in China's foreign trade in 1974 are:

Imports of grain, sugar, cotton, vegetable oils, and other agricultural products increased roughly one-fourth, from a record $1.3 billion in 1973 to $1.6 billion in 1974, 40 percent coming from the United States.

Orders for whole industrial plants from non-Communist suppliers continued strong in 1974, at an $850 million level. Orders for other machinery and equipment fell off substantially from the record 1973 level, to about $300 million.

The relaxation of Peking's conservative attitude toward debt was reflected in trade figures for 1974, with the trade deficit with non-Communist nations reaching $1.3 billion compared with $370 million in 1973.

Japan remained the leading trading partner, with two-way trade in excess of $3 billion ($2 billion in 1973). Whereas exports to Japan had covered all but $165 million of imports from Japan in 1973, a deficit of almost $700 million was incurred in 1974.

Trade with the United States totaled about $1.1 billion ($875 million in 1973); [4] China's trade deficit with the United States was more than $850 million; this deficit will be sharply reduced in 1975, to perhaps one-third of the 1974 figure.

Net hard currency earnings from economic dealings with Hong Kong of $1.6 billion provided the major offset to China's deficit with the developed West in 1974.

Oil exports, boosted by increased physical volume and the quadrupling of international oil prices since mid-1973, have taken up the slack in China's traditional exports, which have been hurt by worldwide recession; earnings from oil were $35 million in 1973, jumped to $140 million in 1974, and are expected to reach $800 million in 1975.

Trade with the other Communist countries consisted largely of (a) the exchange of Chinese foodstuffs, textiles, and other consumer goods for Soviet and East European industrial equipment and (b) Chinese aid deliveries to North Vietnam, Albania, and North Korea.

Foreign economic and military aid take less than 1 percent of China's GNP. The major economic aid venture, outside of food shipments to North Vietnam, continues to be the Tan-zam Railroad project on which

[4] These figures show Chinese imports c.i.f. and thus will be higher than U.S. Department of Commerce figures.

about 13,000 Chinese are working. Military aid is dominated by shipments of small arms to North Vietnam and shipment of tanks, aircraft, and other arms to Pakistan.

VIII. Transportation: Squeezing in More Traffic

At the start of 1975, the key transportation system for the modern part of the economy remains the rail network, supplemented by waterways for the movement of bulk commodities. The rise in oil production is turning the spotlight on the construction of pipelines and port facilities as well as branch rail lines and roads in the new oil-producing areas. In January 1975, Peking announced the completion of a 1,152-kilometer-long pipeline extending from China's largest oilfield at Ta-ching to the port of Ch'in-huang-tao on the Pohai Gulf. Rural areas continue to make do with age-old water and road transport; some areas, however, are being transformed by the extension of rail routes into hitherto isolated regions.

In the past 4 years, the Chinese rail network has grown by 10 percent to more than 44,000 kilometers, twice the size of the pre-Communist network. Recent progress has included (a) the double-tracking of important segments of line in the populous East; (b) the completion of several trunklines; (c) the gradual extension of new lines into the hinterland; (d) additional electrification of trackage, mainly in the mountainous area of Szechwan and Shensi; and (e) construction of industrial spurs, the expansion of rail yards and transfer facilities, and the building of new repair depots.

In 1973–74, growth in freight traffic has exceeded the growth in rail transport capacity. Railroad authorities are now contending with widespread—but not crippling—shortages of freight cars, especially tank cars.

Road construction in 1974 included (a) the construction of nine trunk highways, mainly in the sparsely populated outer areas which depend on roads for movement of long-haul freight; (b) the building of 10,000 km of short-distance roads linking rural counties and communes; and (c) the paving of more than 13,000 km of road with asphalt and residual oil.

In 1974 and so far in 1975, Chinese ports have been generally able to handle increasing shipments from Free World countries. Occasionally, numerous ships have had to wait for berths at Chinese harbors, some for long periods of time. Meanwhile, the Chinese have continued to improve their ports and harbors by dredging, construction of new facilities, purchases of additional materials-handling equipment, and adoption of improved procedures for loading and unloading cargo.

IX. Consumer: Making It Gradually

The rank-and-file consumer has been benefiting in the last 5 years from a series of small improvements in his austere living standards.

> The quality, variety, and availability of foods continue their slow longrun rise. Grain is still rationed, normally in adequate amount, according to age and type of work. Pork, poultry, and fish appear more frequently on the table, as do fresh fruits and vegetables.

Although rationing of cotton cloth persists, clothing standards are generally perking up. Synthetic fabrics are becoming more widely available, for example, and adult garb is gradually departing from monotonic blue or gray.

Housing also shows improvement, especially in rural areas. Members of successful communes are moving up in large numbers to brick and stone houses through the use of local materials and their own labor. In urban areas, apartment blocks are being raised near the new factory buildings, and the stock of old housing seems to be maintained satisfactorily through a combination of private and collective effort.

The pace of improvement is probably most noticeable in the ownership of consumer durables—bicycles especially, and watches, transistor radios, cameras, and sewing machines. China manufactures five million bicycles a year, and the total number now in operation may be about 40 million.

Rudimentary health services are being extended to back areas through "barefoot doctors," the young medical corpsmen with 3 to 6 months' training. The goal of universal primary education is gradually being realized as 5-year primary schools are being set up in even the most remote villages.

The number of small freedoms of choice is gradually expanding. Nonetheless, the basic pattern of consumption continues to be closely regulated by a host of Government and quasi-Government bodies. Finally, the picture of consumption painted by recent visitors to China usually applies only to favored industrial workers and to members of well-to-do communes; it does not accurately reflect the conditions of life of many workers and their families in handicrafts, local industry and transport, and in backward communes.

X. Population: No Surcease—As Yet

Data on China's population and on the current population control program remain so fragmentary that precise numerical estimates are impossible. The figure of 920 million people, used in this paper for mid-1974, implies an annual average growth of 2.2 percent since 1957.[5] To illustrate the wide range of uncertainty in population figures, Vice Premier Li Hsien-nien's statement made in mid-1971 to a Cairo journalist is worth repeating:[6]

> * * * We have been racing against time to cope with the enormous increase in population. Some people estimate the population at 800 million and some at 750 million. Unfortunately, there are no accurate statistics in this connection. Nevertheless, the officials at the supply and grain department are saying confidently, "The number is 800 million people." Officials outside the grain department say the population is "750 million only" while the Ministry of Commerce affirms that the "number is 830 million." However, the planning department insists that the number is "less than 750 million." The Ministry of Commerce insists on the bigger number in order to be able to provide goods in large quantities. The planning men reduce the figure in order to strike a balance in the plans of the various state departments.

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[5] The population series used in this paper is one developed several years ago for general U.S. Government use by the Foreign Demographic Analysis Division of the Department of Commerce. Other estimates imply average growth rates for recent years as low as 1.7 percent.

[6] Cairo Al-Jumhuriyah in Arabic, p. 9, as reported in FBIS–CHI–71–238, 10 December 1971, A8. (Throughout this paper the abbreviation "FBIS–CHI" refers to the index title of the *Daily Report: People's Republic of China*, Foreign Broadcast Information Service.)

In his January 1975 report, Chou illustrated the looseness of the PRC's own population figures by alluding to both (a) a population of "nearly 800 million," and (b) an increase in population of 60 percent "since liberation," or 878 million, using the regime's figure of 549 million for 1949.[7]

Strong factors favoring high fertility are at work in present-day China: Improved nutrition; continued gains in public health, now aided and abetted by the legions of barefoot doctors; [8] the presence of large and growing numbers of women in the childbearing age groups, a result of the baby boom of the 1950's and 1960's; the settled societal conditions of the Fourth Five-Year Plan period; and ingrained attitudes favoring large families, which the immensely improved lot of children in contemporary China has strengthened in some respects.

The present population control program, which is much more determined than the campaigns of 1956–58 and 1962–66, has been in effect only since the Cultural Revolution and has only begun to penetrate rural areas. The author doubts that it has had appreciable effects on demographic rates, or rather, he doubts that it has done any more than offset the strong pronatalist currents noted above. In any case, the data are not available to judge between those who feel that population has continued to grow at perhaps 2¼ percent and those, like Orleans,[9] who feel that population in recent years has grown at 1¾ percent.

The Chinese Government now appears committed to a determined effort to bring the rate of population increase down to 1 percent or below within the next few years. China is beginning to master steroid chemistry and other fields related to birth control technology. Little of this technology was available at the time of the first two birth control campaigns. The account by Djerassi [10] of the amazing progress made by the People's Republic in developing and distributing oral contraceptives is "must reading" in this regard.

The main feature distinguishing China's population control effort, however, is not the grim determination of the policymaker, nor the change in social attitudes as helped along by Government propaganda, nor the availability of new birth control technology—it is the tight-knit organization of Chinese life under the Party. The current birth control campaign has begun the use of "baby quotas" [11] for low-level social units. Under this system, a target is set for the number of births by women in a village or urban block. The quota is discussed, presumably under the usual rules of the game, i.e., "democratic centralism." Women with two or three children normally are not authorized to have additional children; those with one are eligible; and those with none are offered, we are told, medical assistance if they wish off-

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[7] A yearend figure of 548.77 million is given in *Ten Great Years,* Peking, Foreign Language Press, 1960, p. 8.

[8] Contrary to Chinese pronouncements in the past, which suggested that basic public health problems had been solved throughout the whole country, many backward areas still exist. In these areas, the efforts of the barefoot doctors will at first raise population growth rates, for example, through encouragement of better sanitation practices.

[9] For a summary of Orleans' views and for references to other materials on the subject, see *China's Experience in Population Control: The Elusive Model,* prepared for the Committee on Foreign Affairs, U.S. House of Representatives by the Congressional Research Service, Library of Congress, Washington, September 1974; in the foreword, Leo A. Orleans is identified as the author of the publication.

[10] Carl Djerassi, "Some Observations on Current Fertility Control in China," *China Quarterly,* No. 57, January–March 1974, pp. 40–62.

[11] For an account of baby quotas, see Han Suyin *Population Growth and Birth Control in China,* a paper prepared for the International Industrial Conference jointly sponsored by The Conference Board and Stanford Research Institute Sept. 17–21, 1973, in San Francisco, Calif.

spring. Each layer in the bureaucracy, where the system is being installed, has begun setting up birth control committees, establishing targets, holding conferences and expanding the distribution of birth control materials.

The introduction of the "baby quota" system illustrates the organizational power of the Party, the practicality of the leadership, and the difference between China and other societies, say, the U.S.S.R. and India. If Peking were to give highest priority to the sharp curbing of the birth rate over the next decade, it has the organization in place, the technology at hand, and changing social attitudes on its side. Since its reinvigoration after the Cultural Revolution, however, the birth control program has not been pushed in a harsh manner. Furthermore, administrators at all levels have a host of other programs competing for their attention.

XI. Education: Changes Toward the Practical

The commitment to universal education has been one of the brightest aspects of the quarter of a century of revolutionary rule in China. But education for what? By whom? To what level? As part of the wholesale adoption of the Soviet model in the 1950's, the new Chinese regime installed a wide ranging education system designed to bring literacy to the mass of the Chinese and to train the hundreds of thousands of scientists, engineers, and technicians needed for forced-draft industrialization and the ultimate building of advanced weapons. The result was an enormous increase in the number of students, teachers, and administrators at all levels and, soon, an outpouring of technical graduates of all kinds.

During the Great Leap Forward, the educational system was thrown into disarray by shortcut methods of instant education. It recovered with the rest of the economy when the Leap was abandoned. Chairman Mao rightly regarded the restored educational system as patently subversive of his revolutionary goals. The education system, particularly in its higher reaches, (a) relied on the written authority of deceased foreign scholars, (b) accustomed students to the use of the latest laboratory and hospital equipment (far beyond China's means), (c) put technical expertise to the fore at the expense of ideological fervor, and (d) accustomed a privileged class of young people to a life divorced from productive effort, keeping them in student status often through their late twenties. It was no accident that Mao launched the Cultural Revolution with a broad attack on the educational and cultural bureaucracy and that the institutions of higher learning were shut down for 4 academic years, 1966–70.

The Cultural Revolution was in part Mao's last great attempt to (a) reimpose his authority on an increasingly technocratic and independent bureaucracy, and (b) reinvigorate the revolutionary movement with its original spirit of unquestioning loyalty, self-sacrifice, plain living, and egalitarianism. Insofar as this was the case, Mao won his share of battles—but not the war—because he could not, or would not, dismantle the society sufficiently to destroy its deepening technocratic roots.

In education, however, Mao gained many of his objectives. As shown in table 4, the educational system of the past 5 years differs markedly from the older system, especially in the higher ranks. The system reflects Mao's prescriptions of shorter courses, a student body with work experience, a revolutionly faculty, a practical curriculum, and continuous political indoctrination.

TABLE 4.—*China: Change in educational system*

Pre-Cultural Revolution System	*Post-Cultural Revolution System*
1. 6 years of primary school, 6 years of middle school, 4–5 years of college, graduate training in variety of fields.	1. 5 years of primary school, 5 years of middle school, 2–3 years interval of labor or military service, 3–4 years of college, severely restricted graduate training.
2. Preponderance of college students from urban bourgeois background.	2. Preponderance of college students from ranks of young workers, peasants, or soldiers.
3. Core of college faculty with background of Western humanist tradition.	3. Thin remnant of college faculty with background of Western humanist tradition.
4. Maintenance of much of the elitist, lily-white hand tradition of prerevolutionary Chinese scholarship.	4. Emphasis on the combining of classroom work with manual labor and practical experience, all in a spirit of "integrating with the masses."
5. Emphasis on "expertness," i.e., on ability to perform as a scholar, scientist, or official.	5. Emphasis on "redness," i.e., on political attitude and willingness to to serve the revolutionary system.

These Maoist educational standards could not be introduced fullbloom when the universities and technical institutes began to resume operation in the fall of 1970. At first, only a fraction of faculty and student slots were filled, and the curriculum was in turmoil. In the opening rounds of the anti-Confucius campaign, attacks were made on the examination system as a means of determining the suitability of students. Rusticated youths who had spent their time feeding hogs and attending political meetings were praised at the expense of those who had spent their time studying for examinations. This element of the anti-Confucius campaign has been muted in the last few months.

In the current academic year, the situation is still unsettled. A system of recruiting students from factories, communes, and military units is in operation. At the same time, a small number of exceptionally gifted youth are being plucked out of the normal track and given special training in mathematics and other scientific disciplines. The appointment at the National People's Congress of a Minister of Education who was closely connected with pre-Cultural Revolution educational practices suggests that a seeping back of technical and theoretical courses is now in progress.

At the primary level, the goal of universal 5-year education has new impetus. Schools are being established farther out in the countryside, manned by rusticated middle-school graduates. Training of millions of teenagers and young adults in industrial skills, agrotechnology, and paramedical skills has been stepped up in these last few years. The People's Liberation Army takes in roughly 1 million 18-year-olds annually and cycles out a million men with various skills. In general, the educational system is being fattened at the bottom and middle and narrowed at the top; and the distinction between education and training is being blurred.

Of course, not all these educational programs are accompanied by the euphoria portrayed in the official press. Nonetheless, momentum does exist in education, and higher education moves along a distinctly different track from the pre-Cultural Revolution period. Certain of the changes are responsive to at least the short-term needs of the economy:

> The problem of illiteracy is being attacked on a broader front than ever before; this is an economy where peasants have to read instructions on fertilizer bags and workers have to read signs on machinery.
>
> The economy must benefit strongly from the "investment in human capital" represented by practical courses in cultivating cotton and raising pigs, in running a lathe and operating an oil derrick, in commune bookkeeping, and in preventive rural medicine.
>
> The economy benefits when the brightest lad or lass in a rural village is selected to fill the annual slot in a national or provincial college; the older system was, as Mao said, a class system.
>
> The emphasis on practical work experience as a college entry requirement, the practical slant of the new curriculum and the new textbooks, and the general dovetailing of educational and productive needs are all pluses for the economy.
>
> Even the shortening of undergraduate and graduate courses and the narrowing of education at the top will benefit the economy if the forgone classroom hours were, as Mao charged, merely a prolongation of isolation from useful work.

Over the long run, the reformed system does not seem capable of supplying adequate replacements for the several hundred top-drawer scientists, now elderly, who received their advanced training in the United States, Germany, the United Kingdom, and other centers of advanced science. The Government will find itself more and more pressed to restore some of the elitist aspects of the old system if it is to meet the more difficult technological challenges of the future. In the meantime, China still retains much of "the advantage of being behind," that is, the opportunity to benefit from high-technology methods and products on which others have paid the cost of pioneering.

XII. Prospects: Technocratic Future

One of the most striking paragraphs in Chou's speech to the Fourth National People's Congress dealt with the future prospects for the economy:[12]

> On Chairman Mao's instructions, it was suggested in the report on the work of the Government to the 3d National People's Congress that we might envisage the development of our national economy in two stages beginning from the third 5-year plan: The first stage is to build an independent and relatively comprehensive industrial and economic system in 15 years, that is before 1980; the second stage is to accomplish the comprehensive modernization of agriculture, industry, national defense and science and technology before the end of the century, so that our national economy will be advancing in the front ranks of the world.

The economic progress of the People's Republic in the first quarter of a century has been a mixture of palpable successes, partial failures, and unfinished tasks. The economy has showed undeniable strength in its ability to feed a huge population, expand industrial capacity

[12] FBIS-CHI-75-13, Jan. 20, 1975, D23.

and output, and simultaneously maintain a powerful military defense. At the same time, progress has been highly erratic because of political turbulence.

Near-term economic prospects, i.e., for the period of the new Fifth Five-Year Plan (1976–80), are comparatively easy to assess. We know the agricultural and capital plant now in place, and we know the general thrust of plans for the expansion of productive capacity. Agricultural output will increase as greater inputs come from industry, especially when the new foreign fertilizer plants are commissioned toward the end of the plan period. Weather will lose some of its force as the major factor determining annual output, since massive effort continues to go into water control projects. As agricultural technology improves, the blending of the productive factors will increase in importance, for example, the provision of the proper soil and moisture conditions for new seed varieties.

In industry, expansion of output in steel, petrochemical, and other priority branches will be determined largely by new plants already under construction. Industrial growth rates will be held down by continuing strains on capacity in basic industries. The high catchup rates of the years following the Cultural Revolution will not be repeated in 1976–80.

As for foreign trade, the momentum gained in exploring for oil, developing new oil fields, and expanding pipeline and port facilities will maintain oil's top billing as the fastest growing major export. At the same time, short-term prospects are poor for sales of China's traditional exports because of the weakening of demand in the recession-hit industrial economies. Trade and other financial dealings with Hong Kong will continue to yield net annual earnings of more than a billion dollars in hard currency, assuming no great change in the political status of the Crown Colony. Peking almost certainly will move cautiously in expanding its debt with foreign suppliers. As for relations with the U.S.S.R., China has no compelling economic reason for welcoming a rapprochement with its former Communist partner.

China, as argued above, has the administrative muscle, the organizational capacity, and the scientific know-how to rapidly curb population growth. However, this program almost certainly will not get the sustained priority over these 5 years necessary to obtain this result. The reasoning here is that a host of other problems (many attendant upon the fading from power of Mao and Chou) will take up the time of the leadership.

In general, the roots of the PRC economic system—as was demonstrated during the Cultural Revolution—are so deep that only a political cataclysm could dislodge the institutions and practices of everyday economic life.[13]

Among the critical problems of the transition period is the maintenance of productive incentive and morale. Although most people have been benefiting from gradual improvements in living standards, the absolute level remains austere. As is often the case, the most discontent seems to come from not the poorest groups but comparatively

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[13] For an authoritative survey of the whole transitional problem—political, economic, military—see A. Doak Barnett, *Uncertain Passage: China's Transition to the Post-Mao Era*, Washington, Brookings, 1974.

well-off groups who want more rapid improvements. In 1974, for example, spot shortages of consumer goods caused slowdowns and even strikes among industrial workers. Of greater long-run importance is the morale of the urban middle-school graduates, sent to the countryside for a lifetime of service to Chairman Mao. Also of importance to morale is the possibility that hard-liners may come to power and crack down on the private plots and private trade in the countryside.

The possibilities fan out rapidly beyond 1980. In some respects China is peculiarly well-situated for the long haul; the People's Republic:

has the natural resources of a superpower with the consumption standards of an LDC;

has instituted tremendous programs of forestation and water control, which ought to ease the Malthusian pressure; and

has encouraged the rank and file to maintain the timehonored Chinese practices of (a) living frugally, (b) recycling human and animal wastes, (c) making good use of discarded equipment and, in general, (d) squeezing the most possible out of limited resources.

In other respects, China may run into trouble; the People's Republic:

will find it much harder to run a Soviet-style economy when the product mix becomes more complex and the priorities more difficult to sort out; the Chinese economy today does not require as tight gearing as the Soviet economy and hence has not faced some of the problems fundamental to the system; and

may be unable, without the unifying presence of Mao, to keep the spirit of revolutionary sacrifice alive or, alternatively, may lack the resources to make village life palatable to a new educated generation.

Even if the People's Republic succeeds, and it almost surely will, in further outdistancing most other large LDC's by the year 2000, it can hardly make up the enormous gap between itself and the countries in the front ranks. These countries, like Japan and the leading Western nations, could until the last 18 months have been expected to march rapidly ahead from their own advanced position. Now they are beset with the triple problems of recession, inflation, and huge oil bills, headaches which the Chinese leadership has been spared. Regardless of the difficulties of these other nations, however, Peking will need much more time to achieve industrial parity.

As a final word of caution, the economic progress of the People's Republic has been interrupted in the first 25 years by two prolonged periods of political turmoil. Wide differences in approach to economic development persist within the leadership and may be the cause of intensified conflict during the transitional period. The observer thus should not expect economic progress over the next 25 years to proceed in steady straight-line fashion.

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Appendix A

Updating of Simplified GNP Accounts

The dollar estimates of the gross national product (GNP) of the People's Republic of China, 1949–74, presented in this paper were calculated using the same simplified methodology of the author's earlier paper.[14] Briefly, this methodology involves (a) constructing an index of aggregate physical output by combining an index of agricultural production with Field's index of industrial output,[15] and (b) converting this index series to a series in U.S. dollars through use of an estimated value of $48.19 billion for Chinese GNP in 1955. The original JEC–72 series was in 1970 U.S. dollars; the present series is in 1973 dollars; the ratio of the GNP price deflator for 1973 to the deflator for 1955 is 1.6983.[16]

TABLE 5.—CHINA: LINE ITEMS IN CALCULATION OF GNP, 1949–74 [1]

Line item	1949	1950	1951	1952	1953	1954	1955	1956	1957
1–2. Grain (million metric tons)	108	125	135	154	157	160	175	182	185
3. Grain index (1957=100)	58.38	67.57	72.97	83.24	84.86	86.49	94.59	98.38	100.00
4. Food production index (1957=100)	58.38	67.57	72.97	83.24	84.86	86.49	94.59	98.38	100.00
5. Cotton (million metric tons)	.44	.69	1.0	1.3	1.2	1.1	1.5	1.4	1.6
6. Nonfood production index (1957=100)	27.50	43.13	62.50	81.25	75.00	68.75	93.75	87.50	100.00
7. Food index times 0.85	49.62	57.43	62.03	70.76	72.14	73.51	80.41	83.62	85.00
8. Nonfood index times 0.15	4.13	6.47	9.38	12.19	11.25	10.31	14.06	13.13	15.00
9. Agricultural production index (1957=100)	53.75	63.90	71.40	82.94	83.39	83.83	94.47	96.75	100.00
10. Agricultural index times 2	107.49	127.80	142.80	165.89	166.77	167.65	188.94	193.49	200.00
11–12. Industrial production index (1957=100)	19.95	27.44	37.53	48.00	60.57	70.39	72.51	88.44	100.00
13. Line 10 plus line 12	127.44	155.24	180.33	213.89	227.34	238.04	261.45	281.93	300.00
14. GNP index (1957=100)	42.48	51.75	60.11	71.30	75.78	79.35	87.15	93.98	100.00
15. GNP (billion 1973 U.S. dollars)	39.89	48.60	56.45	66.95	71.16	74.51	81.84	88.25	93.91
16. Population, midyear (million persons)	537.9	547.4	558.1	569.9	582.6	596.2	610.6	625.5	640.9
17. Per capita GNP (1973 U.S. dollars)	74.17	88.78	101.15	117.48	122.15	124.98	134.03	141.09	146.53
18. Index of per capita GNP (1957=100)	50.62	60.59	69.03	80.18	83.36	85.30	91.47	96.29	100.00

Line item	1958	1959	1960	1961	1962	1963	1964	1965	1966
1–2. Grain (million metric tons)	200	165	160	160	180	185	195	210	215
3. Grain index (1957=100)	108.11	89.19	86.49	86.49	97.30	100.00	105.41	113.51	116.22
4. Food production index (1957=100)	108.11	[2] 84.23	[2] 81.68	[2] 81.68	97.30	100.00	105.41	113.51	116.22
5. Cotton (million metric tons)	1.7	1.2	.9	.8	1.0	1.2	1.7	1.9	1.8
6. Nonfood production index (1957=100)	106.25	75.00	56.25	50.00	62.50	75.00	106.25	118.75	112.50
7. Food index times 0.85	91.89	71.60	69.43	69.43	82.70	85.00	89.59	96.49	98.78
8. Nonfood index times 0.15	15.94	11.25	8.44	7.50	9.38	11.25	15.94	17.81	16.88
9. Agricultural production index (1957=100)	107.83	82.85	77.87	76.93	92.08	96.25	105.53	114.30	115.66
10. Agricultural index times 2	215.66	165.70	155.73	153.86	184.16	192.50	211.06	228.60	231.32
11–12. Industrial production index (1957=100)	144.77	177.00	184.15	108.04	114.16	136.86	162.74	199.38	230.71
13. Line 10 plus line 12	360.43	342.70	339.88	261.90	298.32	329.36	373.80	427.98	462.03
14. GNP index (1957=100)	120.14	114.23	113.29	87.30	99.44	109.79	124.60	142.66	154.01
15. GNP (billion 1973 U.S. dollars)	112.83	107.28	106.39	81.98	93.38	103.10	117.01	133.97	144.63
16. Population, midyear (million persons)	656.6	671.8	684.6	694.6	704.3	716.3	730.8	746.6	763.2
17. Per capita GNP (1973 U.S. dollars)	171.83	159.68	155.41	118.03	132.59	143.93	160.12	179.44	189.50
18. Index of per capita GNP (1957=100)	117.27	108.98	106.06	80.55	90.49	98.23	109.27	122.46	129.33

See footnotes at end of table, p. 43.

[14] For a complete description of the methodology, See Ashbrook, JEC–72, pp. 41–47.

[15] For the latest computation of this industrial index, see Robert Michael Field's paper in this volume.

[16] *Economic Report of the President*, February 1975, Washington, Government Printing Office, table C–3, p. 252. The value in table 5 of the present paper of $81.84 billion for GNP in 1955 was found by multiplying $48.19 by 1.6983.

TABLE 5.—CHINA: LINE ITEMS IN CALCULATION OF GNP, 1949–74 [1]—Continued

Line item	1967	1968	1969	1970	1971	1972	1973	1974 preliminary
1–2. Grain (million metric tons)	230	215	220	240	246	240	250	255
3. Grain index (1957=100)	124.32	116.22	118.92	129.73	132.97	129.73	135.14	137.84
4. Food production index (1957=100)	124.32	116.22	118.92	129.73	132.97	129.73	135.14	137.84
5. Cotton (million metric tons)	1.9	1.8	1.8	2.0	2.2	2.1	2.5	2.5
6. Nonfood production index (1957=100)	118.75	112.50	112.50	125.00	137.50	131.25	156.25	156.25
7. Food index times 0.85	105.68	98.78	101.08	110.27	113.03	110.27	114.86	117.16
8. Nonfood index times 0.15	17.81	16.88	16.88	18.75	20.63	19.69	23.44	23.44
9. Agricultural production index (1957=100)	123.49	115.66	117.96	129.02	133.65	129.96	138.30	140.60
10. Agricultural index times 2	246.98	231.32	235.91	258.04	267.30	259.92	276.60	281.20
11–12. Industrial production index (1957=100)	201.90	222.10	264.62	313.33	341.15	370.73	415.80	432.27
13. Line 10 plus line 12	448.88	453.42	500.53	571.37	608.45	630.65	692.40	713.47
14. GNP index (1957=100)	149.63	151.14	166.84	190.46	202.82	210.22	230.80	237.82
15. GNP (billion 1973 U.S. dollars)	140.51	141.93	156.68	178.86	190.47	197.41	216.75	223.34
16. Population, midyear (million persons)	780.5	798.4	817.2	836.7	856.9	877.5	898.6	920.1
17. Per capita GNP (1973 U.S. dollars)	180.03	177.77	191.73	213.77	222.27	224.97	241.20	242.73
18. Index of per capita GNP (1957=100)	122.86	121.32	130.85	145.89	151.69	153.53	164.61	165.66

[1] A brief explanation of the methodology and assumptions used in deriving this table is presented in App. A of the present paper; a complete explanation is presented in the author's previous paper (Ashbrook, JEC-72, pp. 41–47). The index number series and the GNP series of this table are presented with 2 extra digits to facilitate intermediate calculations; the extra digits are not themselves significant digits; similarly, the population figures are presented to 4 digits, even though precise data on population are not available.

[2] The food production index deviates from the grain index only in the three disaster years, 1959–61. It was assumed that grain represented 85 percent of the value of food production in all years except for these three, when it represented 90 percent.

Comparison of the Old and New Calculations

Table 5 presents line items that represent successive steps in the calculations as set forth in detail in the earlier paper. In the original calculation, the grain estimate for several years was presented as a range in line 1, and the midpoints were presented in line 2; in the present version, the grain estimates are single-valued estimates for all years; hence lines 1 and 2 are identical. In similar fashion, the industrial production index for several years was presented originally as a range in line 11, and the midpoints were presented in line 12; in the present version, the industrial index estimates are single-valued estimates for all years; hence lines 11 and 12 are identical.

The results of the new computations, in addition to bringing 3 new years into the mold, are (a) to raise the tilt of the GNP curve after 1957, because of higher estimates for grain output starting in 1962 and for industrial production starting in 1958, (b) to introduce a 14 percent inflation element in the monetary value of GNP because of the change from 1970 dollars to 1973 dollars, but (c) to leave the profile of the curve essentially undisturbed. The average rates of growth of GNP and its two components in the new computations (JEC–75) compared with the old computations (JEC–72) are as follows:

[In percent]

Item	1950–57 JEC–72	1950–57 JEC–75	1958–71 JEC–72	1958–71 JEC–75
GNP	10.8	11.3	3.3	5.2
Agricultural output	8.1	8.1	1.0	2.1
Industrial output	19.0	22.3	6.5	9.2
Population	2.2	2.2	2.1	2.1
Per capita GNP	8.3	8.9	1.2	3.0

The new rates for 1950–57 (1949 base) are little changed; the new rates for 1958–71 (1957 base) are appreciably higher. The higher rate for the agricultural component is more satisfactory if, as is done in this paper, a high population growth rate of 2.1 to 2.2 percent is used; the combination of a high population growth rate with a low agricultural growth rate in the JEC–72 paper was unsatisfactory. The rise in the industrial production estimate primarily stems from the inclusion of several new series for fast-growing machinery items in the Field index.

The new calculations yield the following average annual rates of growth for the 17-year period, 1958–74 (1957 base):

	Percent
GNP	5.2
Agricultural output	2.0
Industrial output	9.0
Population	2.1
Per capita GNP	3.0

Observations on the Calculations

These last calculations are generally consistent with long-term trends implicit in Peking's pattern of priorities and confirmed in qualitative fashion by China watchers.[17] First, agricultural output has been growing approximately in line with population. Long-term improvements in food consumption have been gradual. They have taken the form, not of per capita increases in grain production, but rather of improvements in quality, variety, and availability of many non-grain foods. Many of these small betterments are based on the private plots and private livestock; private activity is not taken account of in the agricultural component of the present index. The agricultural numbers are consistent with Peking's concern to raise agriculture to a new plateau in the 1980's in order to handle bad crop years without recourse to large-scale imports.

Second, the long-term rate of growth of industrial production is closer to the 9 percent of the past 17 years than the higher percentage gains calculated from the small bases of the first decade. A rate of 9 percent is remarkable enough, resulting in a doubling of output every 8 years. This rate will edge downward to judge from problems encountered in 1974, when the leadership began to face up to the need for a large new round of investment in basic industrial branches.

Third, the growth in per capita GNP of 3.0 percent reflects the existence of considerable growth potential in the economy, given the effective restraints on the growth of consumption per capita. The absolute per capita GNP figure for 1974 of $240 in this paper is 60 percent above the $150 figure for 1971 in the earlier paper. This results from the shrinkage of the dollar measuring rod, the upward revision of the estimates of agricultural and industrial output used in computing GNP, and the passing of 3 years of moderate economic policy and solid economic growth. The current $240 should be compared to the figure of about $100 in the early 1950's (see table 5). China remains a big poor country—but it is a country that is justifiably proud of its achievements in capital construction and its mastery of modern weapons. China is *sui generis*, by no means an ordinary LDC, yet not a modern industrial nation either.

Criticisms of the GNP Methodology

Three major reservations on the procedures and results of the methodology are:[18]

(1) The sparse coverage of individual commodities; in the agricultural component, only grains and cotton are used, and no distinction is made among individual grains, which may vary widely in economic significance per ton; soybeans, pork, poultry, sugar, and ramie and hemp crops are among the important omissions; in the industrial component, the coverage of the Field index has been raised from 11 major items (JEC–72) to 27 major items, with the coverage of machine building being most strongly affected; with this extension of coverage in industry, the sparse coverage in agriculture remains as the more important issue; the focus on basic agricultural and industrial items at the expense of faster growing nonbasic items may result in an understating of GNP growth.

(2) The subsuming of all sectoral economic activity under the two grand categoris of agriculture-related and industry-related activity; as the Chinese economy takes on a larger product mix with a growing proportion of technologically advanced products, the relation of transportation, communication, finance, trade, health, educational, and Government services to the material sectors will change;

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[17] For another estimate of China's national output, see Shigeru Ishikawa, "Prospects of the Chinese Economy: Trends and Cycles," *Pacific Community*, vol. 4, No. 2, January 1973, pp. 250–264.

[18] This discussion depends heavily on a very helpful critique of the methodology by Dr. K. C. Yeh of the Economics Department of the Rand Corp. The author was unable to follow up on some of Dr. Yeh's valuable suggestions. In many cases, improvements must wait upon the receipt and analysis of more detailed information from the PRC.

because of certain unique qualities of the Chinese economy—such as the absence of a huge rural-to-urban migration—the study of trends in relationships among the various sectors in the PRC may turn up a few surprises; even conceding that the PRC is not moving toward an affluent society, this lumping of sectors may result in an understating of GNP growth.

(3) The use of final output rather than value-added in the agricultural component; because of the sharp upward trend in increases in inputs from the industrial sector into agriculture, the failure to use value-added may result in an overstating of GNP growth; in constructing the industrial index, Field uses wage-bill weights as an approximation for value-added.

A Summing Up

The GNP estimates obtained by use of this simplified methodology have been updated from the JEC–72 paper without any change in the methodology itself. The estimates have been improved by the incorporation of more consistent grain estimates and by the broadening of the industrial component (Field's index). The results, while still rough, seem reasonable. Specifically, the profile of GNP over time, the interrelationships of growth rates (e.g., population versus agricultural production), and the absolute level of per capita GNP appear consistent with the bits and pieces of economic information available from various sources. This simplified methodology will no longer be appropriate when and if the Chinese Government chooses to release the economic data now available within its revivified statistical system.

Appendix B

Sources of Information on the Chinese Economy

In his 1972 article, the author suggested that the flow of economic information from the People's Republic of China would "increase substantially over the next few years after the statistical drought of the 1960's." [19] Three years later, in early 1975, the Chinese Government has only slightly relaxed its tight hold on national production figures. A large statistical apparatus is in place, restored to good bureaucratic health after the disruptions of the Cultural Revolution. Premier Chou En-lai, however, has pushed aside inquiries about the release of more economic data by saying the system needs more seasoning before detailed figures can be made public.

The following notes bring up to date the information in the author's previous account, arranged in the same five categories of information:

(1) Foreign trade data released in varying detail by most of China's trading partners: The level of information from this source remains the same as in 1972. The observer of the Chinese scene continues to draw valuable inferences from analysis of fluctuations in Chinese imports of grain and fertilizer, purchases of machinery and equipment, and exports of manufacturers and raw materials. The growing production and exports of oil are an example of an important trend that has been readily observable through this source.

(2) Economic releases by the Chinese Government: The indispensable reference source for the 1950's, the handbook compiled by the State Statistical Bureau, "Ten Great Years," [20] has faded back in time 3 more years since the previous article. Nothing has replaced it. In retrospect, the handful of national production figures given at the end of 1970 by Chou to the late American author Edgar Snow did not foreshadow the lifting of the statistical blackout. Only fragmentary information has appeared in the Chinese press in 3 years since JEC–72: (a) Sporadic annual production figures for grain, steel, and oil; (b) scattered claims of percentage increases in the national production of coal, electric power, cement, tractors, and other machinery items, often given on the distant bases of 1949, the year of Communist takeover, or 1965, the year preceding the Cultural Revolution; and (c) claims of annual percentage increases in gross industrial production over the preceding year for most of the 29 provincial-level units. These last figures have been successfully reconciled with percentage figures on gross industrial production for all of China by tying the percentages back to the absolute figures published for the 1950's.[21]

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[19] See Ashbrook, JEC–72, pp. 49–51.

[20] Peking, Foreign Language Press, 1960.

[21] Robert Michael Field, Nicholas R. Lardy, John Philip Emerson "A Reconstruction of Gross Value of Industrial Output by Province in the People's Republic of China" (draft of forthcoming article).

At the Fourth National People's Congress in mid-January 1975, Chou included in his "state of the union" address one paragraph on the economic results in 1974. With the exception of some earlier sketchy reports on agriculture output, this paragraph contains practically all the national statistical data released on the year 1974: [22]

"We have overfulfilled the third 5-year plan and will successfully fulfill the fourth 5-year plan in 1975. Our country has won good harvests for 13 years running. The total value of agricultural output for 1974 is estimated to be 51 percent higher than that for 1964. This fully demonstrates the superiority of the people's commune. While China's population has increased 60 percent since the liberation of the country, grain output has increased 140 percent and cotton 470 percent. In a country like ours with a population of nearly 800 million, we have succeeded in ensuring the people their basic needs in food and clothing. Gross industrial output for 1974 is estimated to be 190 percent more than 1964, and the output of major products has greatly increased. Steel has increased 120 percent, coal 91 percent, petroleum 650 percent, electric power 200 percent, chemical ferti izer 330 percent, tractors 520 percent, cotton yarn 85 percent and chemical fibres 330 percent. Through our own efforts in these 10 years we have completed 1,100 big and medium-sized projects, successfully carried out hydrogen bomb tests and launched manmade earth satellites. In contrast to the economic turmoil and inflation in the capitalist world, we have maintained a balance between our national revenue and expenditure and contracted no external or internal debts. Prices have remained stable, the people's livelihood has steadily improved and socialist construction has flourished. Reactionaries at home and abroad asserted that the Great Proletarian Cultural Revolution would certainly disrupt the development of our national economy, but facts have now given them a strong rebuttal."

(3) Eyewitness reports of refugees and emigrants and of journalists, businessmen, technical people, and other visitors to China: This category has produced the main increase in information on China in the past 3 years. As a result of the opening of relations between the United States and the People's Republic, more than 2,000 Americans have visited China. Among these visitors have been several well-known economists, including Alexander Eckstein (Michigan), John Kenneth Galbraith (Harvard), Wassily Leontief (Harvard), and James Tobin (Yale). These Professors of the Dismal Science have received a wide audience for their reports. Their collective observations have helped to solidify foreign appraisals of the Chinese economy and to fill in details of interest to the economic fraternity. Their findings did not, at least so far as the author can judge, modify any of the generally held views about the physical achievements or the overall condition of the economy. This was not surprising. Several years ago, an academic visitor put it something like this, "If you are greatly taken by surprise by what you see in China, you have not done your homework." Presumably, he was referring to the availability of enough first-rate books, films, and journalistic reports by earlier visitors to form a reasonable impression of what things are like in China. In weighing the reports of visitors, it must be kept in mind that (a) visitors usually are selected by the Chinese Government from people at least mildly sympathetic with the government and (b) they normally see only the showplace cities, factories, and communes and have close contact only with carefully screened people.

(4) Soviet analogies: The economy of the People's Republic has the skeletal structure of the Soviet economy because of the adoption of the Soviet system by the new PRC Government in the 1950's. The structural similarity of the two systems has aided the outside observer in piecing together the Chinese economic picture. The use of Soviet analogies, however, had gone about as far as it was going to go by 1972. In the subsequent years, the Chinese—or is it the Soviets?—have been willing to move away from the Soviet model in a number of pragmatic details. At any rate, this now ranks as a wornout source of information on the Chinese economy.

(5) Scholarly appraisals: The last 3 years have witnessed an increased flow of scholarly books and journal articles on China, stimulated by the greater openness of China to the outside world and the accumulating economic and political strength of the PRC. This interest is heightened by fascination with the fate of the revolution in the period that will follow after Mao and Chou leave the scene.

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[22] FBIS–CHI–75–13, Jan. 20, 1975, D21.

Summary: For the student of the Chinese economy, particularly the U.S. student, one of the most important gains in information in the past 3 years has been the on-the-spot observations of Western visitors, including leading American economists. Although the hoped-for lifting of the statistical blackout is yet to come, the generally moderate tone of the Fourth National People's Congress in January 1975 is cause for renewed optimism. Meanwhile, the piecing together of information on the Chinese economy gives varying feelings of confidence about the state of our knowledge of particular economic sectors. We have a good picture of foreign trade flows, a reasonably precise picture of Chinese economic priorities and the general industrial and agricultural situation, and only a hazy picture of the military sector and of details of the annual and 5-year plans. Our appraisal of economic motivation is especially conjectural.

Appendix C

The Chinese Variant of the Soviet Economic Model

The Chinese economy is a variant of the Soviet-style "command economy" that incorporates important features of both traditional Chinese society and the Communist revolution.

Soviet-Style Command Economy

In the 1950's, Sino-Soviet cooperation was at its height and the Chinese were rapidly learning from Soviet engineers and scientists. China adopted the Soviet economic system wholesale, including the following major features:

(*a*) State ownership of industrial, transportation, and financial facilities of any importance;

(*b*) Collectivization of agriculture;

(*c*) Tight centralized control over the division of resources among investment, defense, and consumption and over the allocation of key commodities;

(*d*) Adoption of a development strategy of forced-draft industrialization, under which priority is given to investment and, within investment, to the development of heavy industry;

(*e*) Setting of growth targets in annual and 5-year economic plans;

(*f*) Establishment of a massive bureaucracy to spell out the details of the plans and to administer the day-by-day operation of the economy;

(*g*) Organization of Party units at every level to monitor the performance of the economic bureaucracy and individual enterprises;

(*h*) Formation of mass organizations—trade unions, peasant associations, youth leagues, women's associations, professional bodies—to provide further layers of Party control over the economy; and

(*i*) The use of foreign trade to procure machinery and technology not available at home, with the ultimate objective of economic self-sufficiency.

The Soviet imprint on the Chinese economy was deepened by the dispatch of 12,000 Soviet engineers and technicians to China in the 1950's, the training of several thousand advanced Chinese technical students in the U.S.S.R., the widespread adoption of Soviet technical manuals and administrative handbooks, and the wholesale introduction of Russian language training into the schools.

Furthermore, China became wedded to Soviet technical standards and Soviet-manufactured equipment. The core of the successful basic industrial advance of the 1950's was approximately 150 modern Soviet-equipped projects—steel mills, machinery plants, electric powerplants, et cetera.[23]

Economic contact with the U.S.S.R. is now largely confined to a small flow of spare parts from the U.S.S.R. and border trade in locally produced goods. English has regained its place as the major foreign language in the educational system. Even so, the skeletal structure of the Chinese economy continues to bear an unmistakable family resemblance to the structure of the Soviet economy. In basic industry and in the defense sector, much of the heavy equipment still bears Cyrillic legends. Figure 2 is a schematic diagram of the economic decisionmaking structure of the PRC.

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[23] The Chinese and Soviets had agreed on a program of 300 plants to be constructed over a period of 15 years (1953–67). When the Soviet technicians went home in 1960, about half this number had been completed.

Figure 2

CHINA: Economic Decision-Making Structure

Chairman Mao -- supreme arbiter of basic policy

Standing Committee of the Poliburo of the Chinese Communist Party Central Committee -- collegial establishment of general policy

State Council -- fleshing out of top policy, drafting of state plan and budget, administration of the economy

Central economic ministries -- administration of the various branches of centrally controlled activity

Provincial and sub-provincial layers of government -- administration of locally controlled activity

Centrally controlled, i.e., large-scale, enterprises

Small and local industrial establishments, handicraft shops, agricultural communes

Families and unattached individuals

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Traditional Chinese Features

Several features of traditional Chinese society continue to strongly influence the working of the economy today. Of great importance is the cellular organization of the countryside—starting with the small farm village, most of whose inhabitants are likely to be related; a group of small villages is linked economically to a larger market village; and, in turn, several market villages pay economic and political homage to a still larger administrative town. Peking has long since abandoned the unwieldly commune of the Leap Forward era, which jumbled an average of 25,000 rural people into one big all-purpose supercollective. The government now effectively uses for its own purposes the traditional structure of the countryside:

The village, typically of 100 to 200 people, is the basic agricultural production unit, designated the production team.

The larger market village serves as headquarters for the production brigade, consisting of about 10 production teams.

The old administrative town is the headquarters for the commune, a greatly scaled-down version of its Leap Forward namesake, made up of perhaps a half dozen production bridgades and embracing on the average 8,000 to 9,000 persons.

The cities, are similarly organized in hierarchical fashion. The 5.7 million people of the urbanized areas of Shanghai, for example, are divided into 10 districts averaging a half million people each; and the 10 districts are split into a total of 110 street organizations averaging 50,000 people each. The breakdown proceeds to small lane groups. As in the case of rural organizations, this hierarchical pattern of organization—with people in each unit collectively responsible for meeting the obligations of the group and with a leavening of Party members in each unit—has many parallels with traditional patterns of social control.

As for the family, Communist fulminations against the old-style family are directed more against the inward-looking objectives and the structure of values of the traditional family rather than against its organization. Among the excesses of the Leap Forward was the ill-fated attempt to eliminate the family and to press people into communal barracks, segregated by sex. This scheme never got off the ground because of its unrealistic objectives and the lack of resources to build new housing facilities. It was quickly abandoned in the early stages of the Leap.

One can argue that the family has been greatly strengthened in a number of important ways in the quarter century of Communist rule. For example, once the initial purge of its enemies of the regime was completed, the restoration of economic law and order meant a sharp decline in disruptions of families from flood, famine, disease, war, and crime. Furthermore, the imposition of effective control over the internal movement of all citizens, as well as the recognition of the family as a handy administrative unit, reinforced the pattern of stability. In addition to traditional organizational features, a number of old-style personal characteristics and social behavior patterns continue to be important, in Chinese society today. Among the time-honored personal characteristics of value to the new Communist masters of China: frugality, industriousness, and durability. Among the social behavior patterns of value: adaptability to group endeavor, submission to authority, and feeling of Han racial superiority.

The operators of any Soviet-style command economy quickly come to realize that administrative effort is a scarce resource. No matter how eager and dedicated the new holders of the mandate of heaven, they cannot effectively innovate and follow up in every aspect of Chinese economic life. Thus even the adoption of the totalitarian Soviet model has meant the acceptance of a great deal of old China that should or could not be changed at once. Many everyday customs and procedures must be transferred over to the new statist framework with little alteration. Consequently, the old China hand can point to a host of Chinese ways that have little changed—dietary preferences, a great deal of the housing stock and house furnishings, the appearance of much of the countryside, the tough physical working conditions, the look of a myriad small shops and stalls, and the customs. But equally, the young student of the Communist revolution can draw up his list of Maoist features that have made a vast difference in the conduct of economic affairs.

New Communist Features

The salient Communist features that mark the Chinese version of the Soviet model are mainly nonphysical, that is, they involve aspirations, attitudes, priorities, and sources of motivation.

The Communists, while disavowing racism, have shrewdly exploited the Chinese sense of racial superiority. Enemies of the Maoist regime and Chinese overseas share in the pride of the Chairman's assertion "China has stood up." This pride was in large measure the driving force of the revolution itself; the Chinese people, it was pointed out, have been humiliated by foreigners for 100 years and were not masters on their own soil. This pride helps explain why the Chinese in the late 1950's were willing to goad the Soviet leadership into withdrawing its technicians and their blueprints. It helps explain why Western technicians are now being allowed into China only under severe limitations and why the Chinese like to twit the Soviets about their soliciting Japanese aid for the development of Siberian resources.

The emphasis on self-sufficiency and self-reliance extends to domestic economic activity as well. Chinese spokesmen tirelessly praise the pace-setting Ta-chai agricultural production brigade in Shansi Province for having transformed barren land into productive fields and for not having drawn on the state treasury after flood ruined the crops. In the industrial sector, the crews at the Ta-ching oilfield are cited for their exemplary performance in working under rugged conditions, devising new methods of drilling and pumping oil, making drill bits last longer, and raising output through revolutionary zeal.

Whereas traditional Chinese attitudes prescribe the maintenance of outward face regardless of the real inner attitude, the Communists insist on conformity within—red hearts as well as red exteriors. The Communist pressure to bare one's political soul in public, especially during "struggle-criticism-transformation" campaigns, is perhaps the most disturbing aspect of the new regime for many educated people. By now, most individuals almost certainly have developed fairly successful defenses strategies—based on traditional Chinese skill in masking the inner self. This recalcitrance is periodically denounced in the Communist press.

The new masters are trying to change the old ways of putting self and family first. In many respects, they have succeeded in mustering enthusiasm for national and collective goals, particularly when pride in Chinese superiority is involved. The greatly increased literacy of the population, the spread of newspapers and radio broadcasting, the creation of a national army, and the organizational abilities of the Party have wrought enormous changes in the outlook of the rank-and-file Chinese. In any event, two-thirds of the population has no remembrance of the pre-Communist era. Heretical influences remain, in part because of the impossibility of rooting out all proscribed influences at once and in part because of the wavering within the leadership on the relative importance of political conformity and technical excellence.

A momentous new feature of the economy under Communism is egalitarianism. At the bottom of the economic ladder, the new regime has succeeded in establishing a subsistence floor below which few if any people fall. At the top, the tradition of plain living inherited from the early days of the Party retains considerable vigor. Few nations, certainly not in the Third World, have managed to achieve a like degree of economic leveling.

At the same time, psychological inequality remains. Despite Mao's removal of ranks, titles, and epaulets, the Chinese retain an acute awareness of pecking order. The formation of the 7 May schools, which give chairborne bureaucrats a taste of rough farmwork, are a major example of Mao's continuing struggle against this enduring behavior pattern.

Another revolutionary feature of the economy is the eradication of the great bulk of theft, bribery, racketeering, and prostitution. Present-day China, it has been well said, is a veritable sink of morality. The straight-and-narrow conduct of the great majority of people is no doubt due to a combination of (a) constant surveillance, which makes it difficult not only to engage in wrongdoing but also to enjoy its fruits, (b) wholesale indoctrination, (c) the absence of starvation as a prod, (d) the stabilization of the family unit (as argued above), and (e) pride.

The most common departure from moral probity is the use of influence in getting scarce goods, higher pay, and cushy assignments—what good is it to have friends and relatives if they can't help you out? The placing of relatives in high posts occurs from the very top to the bottom of the system. At the top, the administrative heads of mass women's groups are likely to be the wives of prominent officials. In the middle, the director of a cement factory in a hinterland city receives a special allotment of scarce goods through the back door of a state store or gets his son into the provincial technical institute through a phone call to the head of the Institute's Party committee. At the bottom, the workpoint recorder of a production team enters a few extra points on his cousin's account. Counterforces are set up in the system, for example, the constant pressure on high-ranking cadres to volunteer their children for a lifetime of service in the countryside.

Capsule Assessment of System

While enforcing conformity and thus narrowing choices, the leadership of the People's Republic of China has supplied vigor and pace to the economy in the first quarter of a century of Communist rule. In two major instances, the economy has been shaken by political turmoil, as major economic programs have come under fire. For the period as a whole, a sense of movement and concrete achievement has replaced what was often a sense of futility, frustration, and fatalism. The regime has successfully adopted a variant of the Soviet economic model. It has shrewdly fleshed out the skeleton of the Soviet-style command economy with traditional Chinese elements and Maoist revolutionary principles.

AN ASSESSMENT OF CHINESE ECONOMIC DATA: AVAILABILITY, RELIABILITY, AND USABILITY

By NAI-RUENN CHEN

CONTENTS

I. SOURCES OF CHINESE ECONOMIC DATA

The sources of information pertinent to the economy of the People's Republic of China (PRC) may be classified into two categories. One category contains the sources stemming from Chinese publications, news releases and broadcasts.[1] The bulk of these materials is translated into English by the U.S. Consulate General in Hong Kong, the Joint Publications Research Service, and the Foreign Broadcast Information Service.[2] A concise summary of economic information contained in Chinese broadcasts is published weekly by the British Broadcasting Corporation.[3]

The other category consists of mainly secondary sources originating outside the Chinese mainland.[4] Included are refugees' and visitors' reports, publications in Hong Kong, Taiwan, Japan, and Europe and scholarly studies and Government reports published in the United States. In addition, large quantities of foreign statistics can be found

[1] In the 1950's there was a relatively large number of Chinese publications containing economic information. The number has diminished greatly since 1960, and at present only a few periodicals and newspapers are available to the West. These periodicals include *Peking Review, China Reconstructs, China's Foreign Trade, Hung-ch'i* (Red Flag), and *Hsueh-hsi yu pi-p'an* (Study and Criticism). Chinese newspapers available outside the mainland are *Jen-min jih-pao* (People's Daily) and *Kuang-ming jih-pao* (Kuang-ming Daily) and occasionally a few local dailies mainly from Kwangtung Province. Certain Chinese publications in Hong Kong, such as *Ta-Kung Pao* (Ta-Kung Daily), *Wen-hui Pao* (Wen-Hui Daily) and *Ching-chi tao-pao* (Economic Reporter) also include reports on the PRC economy. In addition, books and monographs published in China sometimes contain economic data.

[2] These translations appear in *Survey of China Mainland Press, Selections from China Mainland Magazines,* and *Current Background* (all by American Consulate General in Hong Kong), *Translations on the People's Republic of China* (by U.S. Joint Publications Research Service), and *Daily Report—People's Republic of China* (by U.S. Foreign Broadcast Information Service, hereafter abbreviated as FBIS).

[3] *Summary of World Broadcasts* (SWB), Part 3, The Far East, Weekly Economic Report, published by the Monitoring Service of the British Broadcasting Corporation.

[4] Some unpublished official documents also have become available outside the mainland. For an example, a number of classified materials have turned up in the publications issued by research organizations in Taiwan. A recent document of the Kunming Military Region contains some economic information, and is included as an appendix to a monograph entitled *Chinese Communist Internal Politics and Foreign Policy* (Taipei, Taiwan: Institute of International Relations, 1974).

in the publications of China's trading partners. These statistics are readily available in several sources.[5]

II. Qualitative Data on the Chinese Economy

The main purpose of this paper is to assess the availability, reliability, and usability of the quantitative economic data published by the Chinese. However, the qualitative information published in China is also indispensable to research on the Chinese economy, which in the last 25 years has undergone frequent and drastic changes in both basic structure and the system of planning and management. In this section, therefore, a few comments on qualitative data are in order.

The amount of available information on Chinese economic policy and institutions was already scarce in the 1950's by international standards, and diminished further after 1960. Western scholars were able to perform fairly penetrating analyses for the 1950's of certain aspects of the Chinese system such as land reform, agricultural collectivization, the statistical system, wage patterns, the incentive structure, the price system, the budgetary system, monetary policy, and industrial management. Any in-depth study of one of these or other institutional aspects of the Chinese economy during the last 15 years would be nearly impossible due to lack of information. The possible exception is the commune system, on which there are relative large quantities of available data relating to its organization, management, production, distribution, labor allocation, and the like.

Chinese economic data are most scarce at the macro level. Since the early 1960's no detailed documents on economic policy and planning have been published. The PRC is now in the final year of the Fourth Five-Year Plan (1971–75), yet the contents of the plan have not been made known. None of the recent visitors to China was able to obtain any significant information on the planning apparatus, the statistical system and the price mechanism. In the last few years, an increasing number of speeches and articles have appeared to discuss the tax structure, financial achievements, international economic policy, environmental measures, and population problems. But no significant amount of new information was disclosed.

In the absence of systematic qualitative data, economic researchers on China are faced with tremendous difficulties in their attempts to achieve detailed analyses of the PRC economy. However, some problems of a broad nature may be analyzed on the basis of fragmentary data. One possibility is to study a macroeconomic problem through a painstaking process of piecing together micro data from a variety of sources.

Another way is to examine changes in the Chinese economic policy or system within a broad framework formulated on the basis of scattered, and sometimes seemingly unrelated, official statements. For example, a reasonably clear understanding of the evolution of Chinese economic policy and shifts in planning priorities may be gained by bringing together a number of Mao's quotations on economic matters and then examining the background and origin of these quotations and their

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[5] These sources include *World Trade Annals* prepared by the Statistical Office of the United Nations, *Statistics of Foreign Trade Series* published by the Organization for Economic Cooperation and Development, and various publications of the U.S. Department of Commerce. Additional trade data may be found in a number of specialized publications such as *China Trade and Economic Newsletter* (London).

significance in the context of current development.[6] Another example is to appraise China's current foreign trade policy by comparing recent official statements [7] with a number of authoritative articles published in the 1960's and the 1950's [8] to determine if the official position toward foreign trade has been changed. A third example is to assess China's economic thinking and current policy toward imported equipment and technology through an analysis of the recent debate over the importation of advanced industrial techniques from developed countries.[9]

More methods can be cited. Research on most areas would necessarily lead to broad generalizations. Except for a few cases where both qualitative and quantitative data are relatively abundant, any profound analysis based on the former alone would be most difficult.

III. Types of Available Chinese Statistics

While the available amount of qualitative data on the PRC economy is limited, the amount of published Chinese statistics is even more scarce. For the 1950's, in addition to a number of figures scattered in a variety of books, journals, and newspapers, there was only one slender statistical handbook, *Ten Great Years*, published in 1959.[10] An almost total statistical blackout of macroeconomic data was imposed by the Chinese authorities for the entire decade of the 1960's. Then Premier Chou En-lai gave some aggregative data for 1970 to the late Edgar Snow during the winter of 1970–71.[11] Since then, a flow of statistical information has resumed, but on a scale smaller than that of the 1950's.

Figures published since 1970 may be classified into three groups according to the level of aggregation. One group consisted of statistics pertaining to the economy as a whole. Most of these statistics are percentage rates of growth over the preceding year and/or 1965, the year before the Cultural Revolution. The output indexes for 1974, reported by Premier Chou in his speech to the National People's Congress in January 1975, were based on 1964.[12] Frequently these percentages were given without bases. Included in the second group were statistics relating to individual provinces, autonomous regions, and municipalities. Absolute figures appeared more frequently in this group, but

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[6] Some of Mao's quotations were analyzed in my paper, "China's Foreign Trade Policy: A Current Appraisal." (Research Note No. 9, Trade Analysis Division, Bureau of East-West Trade, U.S. Department of Commerce, Aug. 15, 1974).

[7] These statements are contained in the following articles: "Chairman of Chinese Delegation Teng Hsiao-ping's Speech at Special Session of U.N. General Assembly," *Peking Review*, No. 16, Apr. 19, 1974, pp. 6–11; Li Chiang (Minister of Foreign Trade), "New Developments in China's Foreign Trade," *China's Foreign Trade*, No. 1, 1974, pp. 1–5; Wang Yao-ting (Chairman of the China Council for the Promotion of International Trade), "China's Foreign Trade," *Peking Review*, No. 41, Oct. 11, 1974, pp. 18–20, 26; and Shu Hsun, "Develop Foreign Trade by Maintaining Independence and Keeping the Initiative in Our Own Hands and Relying on Our Own Efforts," *People's Daily*, Oct. 15, 1974, p. 6.

[8] These articles include: The Writing Group of the Peking Municipal Revolutionary Committee, "China's Road of Socialist Industrialization," *Hung-chi*, No. 10, 1969, pp. 22–31; and *The Common Program* of the Chinese People's Political Consultative Conference adopted Sept. 29, 1949 (Article 57).

[9] The policy toward imported technology and equipment has been debated often in China. In early 1974 the debate was resumed with increased intensity. The revival of the discussion came with the publication of two articles in the January and February 1974 issues of the Party journal, *Hung-chi*. Two articles in the *People's Daily* related the discussion on Mar. 22, 1974, and another appeared on May 3 of the same year.

[10] Most of the statistical data for the 1950's may be found in Nai-Ruenn Chen, *Chinese Economic Statistics*, Chicago: Aldine Publishing Co., 1967.

[11] Edgar Snow, "Talks with Chou En-lai: The Open Door," *The New Republic*, vol. 164, No. 13 (Mar. 27, 1971).

[12] Chou En-lai, "Government Work Report Delivered to the Fourth National People's Congress, Jan. 13, 1975," *People's Daily*, Jan. 21, 1975, p. 1.

most of the production data were still given in percentage terms. The third group contained the numerical information at more disaggregated levels such as statistics for cities, counties, factories, communes, and production teams. In this group absolute figures appeared most frequently, and a wide range of data was published on various aspects of Chinese economic life.

Recently published Chinese statistics also may be grouped according to economic sector. The following gives a brief summary of the types of statistics available for each sector.

Industry

Output figures are available in absolute amounts only for crude oil, steel, chemical fertilizers, and cotton cloth. Percentages can be found for, in addition to these products, electric power, coal, natural gas, timber, iron ore, pig iron, rolled steel, mining equipment, metallurgical equipment, medical equipment, powered irrigation equipment, tractors, internal combustion engines, rice transplanters, insecticides, chemical fibers, polyester fabric, cotton yarn, and a number of consumer goods such as radios, television sets, sewing machines, bicycles, watches, woolen textiles, sugar, salt, canned food, and certain athletic goods. A large number of figures for the output of these and other products are also available at provincial and lower levels.

Percentage data on the gross value of industrial output have been published for certain years at both national and local levels. These data are relatively plentiful for provinces and their equivalents. Indexes of the gross value output of light industry may be found for some provinces and smaller administrative units. Figures for a given year are generally shown as a percentage of the 1949 or 1965 level.

In addition to physical and value output estimates, available industrial data include the number of technical innovations accomplished, the number of new products, the number of product varieties and specifications and the rate of cost reduction. One useful type of available information shows the growth of small industry in China. Data have been published for several industries on the number of small plants, the rates of increase in the output of these plants, and the share of the output of small plants in total output. These data may be found in relatively large quantities at all levels for certain industries supporting agricultural production such as hydroelectric power, agricultural machinery, chemical fertilizer, and cement. Scattered information also may be found for small iron and steel plants, electronics factories, and coal mines.

Some published statistics are labeled as "the support of industry given to agriculture." These data were usually shown in terms of percentage increases in the supply to agriculture of tractors, chemical fertilizers, insecticides, irrigation and drainage equipment, internal combustion engines, and electricity.

Transportation and Communications

Some percentage data have been published for the country as a whole on railways, highways, inland navigation, freight volume, and postal service. Absolute data in terms of kilometers can be found for 1971.

Similar types of statistics, in both absolute and relative terms, are available for provinces and lower administrative levels. Some data on telecommunications in rural areas also exist.

Agriculture

At the national level, with the exception of total grain output for which official estimates have been published in terms of tons or catties, only relative figures are available for the output of a few individual grain and cash crops. For some other crops only general indications are given as to whether their output rose or declined without any numerical information. For most crops even such indications are not shown.

Data on crop acreage, irrigated area, and afforested area, to the extent that they have been released, are given in the form of relative changes over time or annual increments. Available livestock data include relative numbers for draught animals, pigs, sheep and goats. Some percentages can be found for the output of aquatic products, the gross value of agricultural subsidiary output, and the gross value of total agricultural output.

At the provincial and lower levels, agricultural data are much more plentiful. They are more frequently shown in absolute terms, and in greater variety than agricultural statistics at the national level. Included in local data are also such items as crop yield per unit of land, the number of water conservancy projects, increases in farm land, the size of rural labor force participating in farm construction work, and the number of communes.

Finance and Trade

A variety of percentages are available for certain financial and commercial indicators including state investment in provinces, agricultural taxes, state appropriations in support of agriculture, increases in rural income, wages, agricultural loan, bank savings, state purchases and retail sales of selected products, commodity prices, social purchasing power, and foreign trade. Absolute figures may be found for certain years for the prices of certain products such as flour, rice, pork, and vegetables, and for the export of rice and the import of other cereals.

As for other sectors, statistics for finance and trade become more abundant and varied at more disaggregated levels. It may be interesting to note that in contrast to the 1950's, some statistics on the foreign trade of certain regions, particularly those on the export trade of a few provinces and lower administrative areas, have become available in recent years.

In addition to the above sectoral statistics, there exist some data at local levels on population, medical services, school enrollment, and other health, educational and cultural services.

While the PRC appears to have partially lifted restrictions of its publication policy with respect to statistical information since 1970, many types of data which were published in the 1950's still remain unavailable. Certain types of data, such as most of the industrial and agricultural output figures, which previously were available in absolute terms, either have been made known only in relative terms or have been totally withheld. Other types of data, which the Chinese were free to release during the 1950's, have been excluded from publication; among them the following are the most important: (1) national income and its components; (2) fixed assets and working capital; (3) state and provincial budgets; (4) technological coefficients for industrial products; (5) price and cost-of-living indexes; (6) labor force, labor productivity, and money and real wages; and (7) distribution of population by age, by sex, and by rural and urban areas.

IV. Reliability of Chinese Statistics

Questions have frequently been raised about the credibility of Chinese statistics that have been released thus far by the People's Republic. How reliable are published Chinese statistics? Do the Chinese attempt to fabricate statistics for propaganda purposes? Answers to these questions are of fundamental importance, for if Chinese statistics are not sufficiently credible, research on the PRC economy would become almost impossible.

The quality of Chinese statistics has been discussed by a number of writers.[13] The general consensus is that while Chinese statistics suffer from many deficiencies, deliberate falsification is not practiced by the central authorities. Such belief is in part based on a high degree of internal consistency of published Chinese statistics.

Several attempts have been made to check the consistency between aggregate and disaggregated data published in the 1950's. Ronald Hsia finds no wide discrepancies between total purchases of agricultural products by the state and state purchases of individual agricultural products.[14] A study of Kang Chao indicates a close relation between output of various industrial products and their technological coefficients and factor inputs.[15] K. C. Yeh in his study of Chinese petroleum industry concludes that "by and large, the output figures are consistent with the available information on capacity." [16] A systematic and detailed check of certain types of published Chinese data by Dwight Perkins shows "a considerable degree of consistency between raw price data and various price indexes, between data of grain purchases and sales in both calendar and grain years, and, finally, between price data, tax rates, tax revenue, and industrial production statistics." [17]

The findings of three recent studies on the PRC economy are most illuminating. Field, Lardy, and Emerson, in their attempt at reconstructing the gross value of industrial output by province, find an

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[13] For a discussion of the quality of Chinese statistics published in the 1950's see Kang Chao, *The Rate and Pattern of Industrial Growth in Communist China,* Ann Arbor: University of Michigan Press, 1965; Alexander Eckstein, *The National Income of Communist China,* New York: Free Press, 1961, and *Communist China's Economic Growth and Foreign Trade,* New York: McGraw-Hill Book Co., 1966; Choh-ming Li, *The Statistical System of Communist China,* Berkely: University of California Press, 1962; Ta-Chung Liu and Kung-chia Yeh, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933–1959,* Princeton, N.J.: Princeton University Press, 1965; and Dwight H. Perkins, *Market Control and Planning in Communist China,* Cambridge, Mass.: Harvard University Press, 1966. Some comments on the quality of Chinese statistics published in more recent years may be found in Leo A. Orleans, "Chinese Statistics: The Impossible Dream," *The American Statistician,* vol. 28, No. 2, May 1974, pp. 47–52; and Thomas A. Rawski, "Measuring China's Industrial Performance, 1949–73," a paper presented at the Conference on Reconciling Quantitative Measures of China's Economic Output, Washington, D.C., Jan. 17–18, 1975.

[14] Ronald Hsia, *Agricultural Output in Mainland China,* cited in Dwight Perkins, *op. cit.,* p. 220.

[15] Kang Chao, *op. cit.,* pp. 50–75.

[16] K. C. Yeh, *Communist China's Petroleum Situation,* Santa Monica, Calif.: The Rand Corporation, RM–3160–PR, May 1962, p. 1.

[17] Perkins, *op. cit.,* quotation on p. 220.

extremely close correspondence between the sum of provincial totals of the gross value of industrial output, pieced together from a large number of sources, and the reported national totals for 1952 and 1957.[18] Thomas Rawski's study of the measures of China's industrial performance indicates that for the years 1952–57 close agreement exists between the official statistics of aggregate gross value and independent series constructed from commodity and price data.[19] Examining Chinese agricultural statistics at both national and provincial levels Thomas Wiens demonstrates that "Chinese statistics for the 1949–57 period are on the whole internally consistent to the extent that we can disaggregate and that they are also reconcilable with statistics from the Republican Period." [20]

Aggregative data published in recent years also have been found generally consistent with their components. In a recent study of China's petroleum industry Chu-yuan Cheng compares official estimates of the total output of crude oil with the output estimates for various oil fields, and concludes that "from cross checks, backward and forward derivations, it appears that most official data (on crude oil output) are consistent." [21] Field, Lardy, and Emerson find the official claim that the gross value of industrial output for the nation in 1971 was 21 times that in 1949 consistent with the provincial figures derived from scattered reports.[22] This finding was supported by that of Rawski. His estimate of the gross value of industrial output for 1971, constructed from sectoral data including a wide range of industrial commodity estimates, agrees closely with the estimate derived from the official claim regarding overall industrial performance in that year.[23] My own checks also show no major divergence between the percentage increase in the gross value of industrial output for the country as a whole during 1965–73 and the industrial growth rates of various provinces, autonomous regions, and municipalities during the same period, and between the total number of small fertilizer and cement plants in 1973 and the numbers of these plants in individual provinces and their equivalents in the same year.

A comparison of some of the statistics published in the 1970's with those in the 1950's again does not seem to reveal any major inconsistency. For example, the official production figures of grain, crude steel, chemical fertilizers, crude oil, and cotton cloth published for these two periods seem to correlate closely on the basis of what has become known about the development of these sectors in the last 25 years. Field, Lardy, and Emerson connected the provincial indexes of the gross value of industrial output for the 1960's and 1970's with the absolute data for the 1950's to estimate the absolute totals for the country as a whole for the years 1965–73, and the resulting estimates seem to reflect in general China's industrial growth in the last decade.[24]

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[18] Robert Michael Field, Nicholas Richard Lardy, and John Philip Emerson, *A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–1973*, Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, forthcoming.

[19] Thomas Rawski, *op. cit.*

[20] Thomas B. Weins, "Agricultural Statistics in the People's Republic of China: Another Look," a paper presented at the Conference on Quantitative Measures of China's Economic Output, Washington, D.C., Jan. 17–18, 1975.

[21] Chu-yuan Cheng, *U.S. Export Potential of Petroleum Equipment to the People's Republic of China*, prepared for the Office of East-West Trade Analysis, Bureau of East-West Trade, U.S. Department of Commerce, under contract No. 4–36289, September 1974.

[22] Field, Lardy, and Emerson, *op. cit.*

[23] Rawski, *op. cit.*

[24] Field, Lardy, and Emerson, *op. cit.*

There also appears to be a broad consistency between quantitative and qualitative data. Perkins cited a few examples to support this contention for statistics published prior to the Great Leap Forward.[25] In an attempt to ascertain the changing pattern of spatial distribution of Chinese industry, I gathered data to derive estimates for the percentage increase in the gross value of industrial output between 1965 and 1973 for various provinces, autonomous regions, and municipalities.[26] A rank test for the significance of the difference in these industrial growth rates between coastal and inland provinces suggests that industrial production in the interior grew more rapidly than in the coastal areas. A second test was made to measure the degree of relationship between two sets of ranks—the ranks of various provinces and their equivalents according to the gross value of industrial output in 1954 and their ranks according to the rates of industrial growth during 1965–73. The rank correlation coefficient is significant at the 5-percent level. These two tests together suggest that industrially backward provinces, which are mostly in the interior, tended to develop more rapidly than more advanced provinces, most of which are located in the coastal areas. These findings seem to accord with the available information showing that the Chinese policy is to spread industry to the interior, and that in recent years state investment has gone up sharply in some of the industrially backward provinces.[27]

Proof of internal consistency of published Chinese statistics does not constitute proof of lack of outright fabrication. Could not the Chinese practice statistical falsification in the sense of what Prof. Abram Bergson in his discussion of Soviet statistics has called "free invention under double bookeeping?"[28] As in the Soviet case, the answer seems to be in the negative. There is no evidence to indicate that the Chinese maintain two sets of national statistics, one for planning and another for propaganda. In fact, several considerations point to the contrary.

To maintain two sets of statistics would require a huge administrative apparatus and a high degree of statistical sophistication. The PRC inherited a weak statistical foundation in 1949, and encountered many difficulties in the establishment of a state statistical system during the 1950's.[29] These difficulties were aggravated by the poor quality of the working force in statistics.[30] The quality deteriorated further in the Great Leap Forward, and probably again was affected adversely during the Cultural Revolution. Since there are literally millions of basic accounting units in China, the supply of statistical personnel has never been able to meet the demand.[31] It is difficult, therefore, to envisage how a vast country like China with a statistical working

[25] Dwight Perkins, *op. cit.*, pp. 220–221.

[26] Nai-Ruenn Chen, "Industrial Development in China," Trade Analysis Division, Bureau of East-West Trade, U.S. Department of Commerce, Research Note 11, October 1974.

[27] For example, state industrial investment in Ningsia Hui Autonomous Region in the 7-year period 1966 to 1973 was 85 percent above total state investments in the region in the 17-year period 1949 to 1965. (*People's Daily*, Aug. 26, 1973, p. 3.)

[28] Abram Bergson, "Reliability and Usability of Soviet Statistics: A Summary Appraisal," *The American Statistician*, vol. VIII, No. 3 (June–July 1953), pp. 19–23.

[29] For an excellent discussion of China's statistical system in the 1950's, see Choh-ming Li, *op. cit.*

[30] As pointed out by the State Statistical Bureau in May 1954, "an overwhelming majority of the national statistical working force never had any special training in statistics, lacking any knowledge in statistical work or economic construction * * *" (Cited in Li, *op. cit.*, pp. 51–52.)

[31] Leo Orleans estimated that "the number of persons with high degree in statistics was very small; probably not more than a few hundred a year obtained degrees between 1961 and 1966." (Orleans, *op. cit.* p. 50.)

force deficient in both quality and quantity could operate a double bookkeeping system on a national scale without detection.

If the Chinese Government were to compile a separate set of statistics for propaganda, those propagandized would have included the Chinese people on the mainland.[32] The statistics contained in Chinese broadcasts to the areas outside the mainland such as Taiwan, Japan, Southeast Asia, and the Soviet Union, and in foreign-language publications such as *Peking Review*, *China Reconstructs*, and *China's Foreign Trade* have usually appeared also in domestic broadcasts and in publications for domestic circulations such as *Jen-min jih-pao* and *Hung-chi*. The Chinese Government relies heavily on the news media *Jen-min jih-pao* in particular, to disseminate information and directives throughout the country. False economic data would tend to mislead cadres at various levels in making economic decisions, and therefore would have disruptive effects on the economy.

The PRS appears to have adopted a policy of withholding unfavorable information and publishing mainly statistics showing success. As noted earlier, there was and still is a concealment of most of national production statistics for the 1960's when the economy suffered difficulties and disruptions. The industrial statistics published so far for the 1970's have covered mostly those industries with high growth rates, and relatively few figures have been released for those industries having mediocre performance. As Professor Li points out:

> If it is true that only statistics of achievements are published while those reflecting difficulties and problems are either withheld or not collected at all, then there are not likely to be two sets of national statistics * * *.[33]

This contention is also borne out by a check of official claims against data gathered outside China. For example, Chinese sources indicate that foreign trade turnover (exports and imports combined) in 1972 was 48.4 percent larger than that in 1965, and that 1973 trade turnover was 466 percent larger than that in 1952 and 159 percent larger than that in 1965.[34] These claims are basically consistent with independent estimates constructed on the basis of the trade statistics of China's trading partners.[35] Another example is Chou En-lai's statement that 1970 cloth output was 8.5 billion meters. This figure compared with cloth output figures published for the 1950's seems to be in general agreement with the outside information about the PRC economy such as raw cotton output and imports, cotton cloth exports, per capita consumption of cotton cloth, and the state of the synthetic fiber industry during the corresponding period.[36]

Based on the above considerations it may be concluded that Chinese statistics are not deliberately falsified by the central authorities. This conclusion, however, does not imply that deliberate falsification is not practiced by lower administrative echelons. On the contrary, falsifica-

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[32] This point was raised in Perkins, *op. cit.*, p. 216.

[33] Choh-ming Li, *op. cit.* p. 149.

[34] Li Chiang, *op. cit.*; *Peking Review*, Nov. 30, 1973; and Shu Hsuan, "Develop Foreign Trade by Maintaining Independence Keeping the Initiative in Our Own Hands and Relying on Our Own Efforts." *People's Daily*, Oct. 15, 1974, p. 6.

[35] See Nai-Ruenn Chen, "China's Foreign Trade, 1950–74," in this volume; and Alexander Eckstein, "China's Economic Growth and Foreign Trade," *U.S.-China Business Review*, vol. 1, No. 4 (July–August 1974), pp. 15–20.

[36] Rawski, *op. cit.*

tion at lower levels was quite extensive in the 1950's.[37] The problem became so serious in the Great Leap years of 1958 and 1959 that agricultural output figures initially published for these years had later to be scaled down considerably.

The central authorities were fully aware of the imperfect reliability of the data submitted to them, and of the necessity to compile accurate statistics for economic planning. The State Statistical Bureau was seriously concerned over the problem, and soon after its establishment in 1952 steps were taken to improve the quality of statistical work. This effort was disrupted by the Great Leap campaign and then probably again by the Cultural Revolution. In view of the restoration of the economic planning mechanism in the last few years, a system of statistical quality control semblance to that of the mid-1950's may now be in operation. However, given the intense pressures on industrial and rural cadres to fulfill and overfulfill production targets, one may suppose that varying degrees of falsification probably still exist in the statistical reporting to the center by the cadres of state enterprises and communes.

Since little is known about Chinese statistical system since 1960, one is not certain how much, if any, improvement has been made in statistical quality in the last 15 years. If the statistics published in the mid-1950's can be used as a guide, some generalizations may be made of the comparative reliability of different types of available statistics on the PRC economy. Various economic sectors may be ranked according to a decreasing degree of data reliability: Industry, transportation and communications, trade, finance, construction, and agriculture. Data for state enterpises are more reliable than those for local enterprises and rural communes. Physical output data tend to be better than aggregative value data.

V. Usability of Chinese Statistics

To the extent that the central authorities fully realize the degree of possible falsification by lower echelons in collecting and reporting statistics and take corrective measures to improve them, and that the published statistics are in fact used by Chinese economic planners, these statistics may serve as first approximations in studying the PRC economy. However, the general usability of Chinese statistics is subject further to a number of other limitations, the most important of which are discussed in this section.

One of the most frustrating problems facing users of Chinese statistics is to find out what a given statistic means. One cannot use Chinese statistics meaningfully without knowing their definition, coverage, and classification. And yet the meaning of Chinese data is often left unexplained, especially for those published in recent years. Two examples may be cited.

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[37] Commenting on the reporting of agricultural statistics in the 1950's, Professor Li writes, "Reports were invariably readjusted by party and political leaders at every level of local government, where the conflict of interests had to be reconciled between the production bureau which tended to inflate the figures and the bureau of tax collection and internal trade which tended to do the opposite. Collectivization in 1956 and 1957 did not contribute any improvement to the mechanism of statistical reporting, but rather produced a predominantly upward bias on the part of local leadership in editing the figures." (Choh-ming Li, *op. cit.* p. 58.)

The Chinese claimed that the gross value of light industrial output in 1973 was up 8 percent over 1972.[38] A number of claims were also made for the growth of light industry in various provinces and localities in the last few years. But no explanation is given as to the definition and coverage of light industry. In the 1950's the PRC published statistics on the gross value of output for consumer goods industry rather than light industry.[39] It is not clear to what extent in Chinese statistics light industry is defined differently from consumer goods industry, or whether the two terms are simply used interchangeably.

A similar vagueness may be found in a recent statement by Foreign Trade Minister Li Chiang. It is stated that "in export, the percentage of industrial and mining products has risen steadily, accounting for 65 percent in 1973." [40] Yet no explanation is available as to how "industrial and mining products" are defined in Chinese foreign trade statistics.[41]

Confusion and misunderstanding also result from changes in definition or coverage usually without appropriate adjustments to published figures or adequate explanations. For example, according to official statistics the yearend number of workers and employees in Chinese industry rose from 7,907,000 in 1957 to 25,600,000 in 1958.[42] The more than tripling of the size of China's industrial labor force in 1958 was not solely due to rapid industrial expansion in this year of the Great Leap, but also to a significant degree attributable to a reorganization of handicraft workers into state factories. To take another example, the gross value of industrial output at 1957 prices was reported to have increased from 70.4 billion yuan in 1957 to 117 billion yuan in 1958.[43] A large part of such increase, however, was statistical, and some of the statistical increase was due to a change in the treatment of the output of subsidiary agricultural activities. During the First Five-Year Plan period, the processing by peasants of agricultural products, such as grinding grains and slaughtering animals, and handicrafts produced by peasants for their own use, such as tailoring and making shoes and socks, were classified as a part of agricultural production under the heading of subsidiary agricultural output. Beginning in 1958 these subsidiary activities of peasants were shifted from agriculture to industry, and became part of the gross value of industrial output.[44]

A third example is the shift in 1960 from biological yield to barn yield as the basis for measuring crop production.[45] The established practice in China, at least up through 1958, was to measure crop production by biological yield. The discrepancy between biological out-

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[38] *Peking Review*, Jan. 4, 1974.

[39] Statistics on the gross value output of consumer goods industry were published for 1949 through 1959. See Nai-Ruenn Chen, *Chinese Economic Statistics*, table 4.37.

[40] Li Chiang, *op. cit.*, p. 1.

[41] According to the *Ten Great Years* (p. 176), exports are classified into three categories: Industrial and mining products; processed products of agriculture and side occupations; and products of agriculture and side occupations. No explanation is given for the definition and coverage of these export categories. In 1958, industrial and mining products accounted for 27.5 percent of total exports. It is not known whether the rapid rise in the ratio to 65 percent in 1973 was purely the result of economic development or might be in part due to changes in definition and coverage.

[42] Nai-Ruenn Chen, *Chinese Economic Statistics*, table 11.2.

[43] *Ibid.*, table 4.37.

[44] Department of Statistics and Planning, Hupeh University, *Industrial Statistics*, Wuhan: Hupeh jen-min chu-pan-she, 1960, pp. 9–10; and Field, Lardy, and Emerson, *op cit.*

[45] Huang Chien-t'o, "Major Tasks in the Agricultural Statistical Work Program for 1960," *Chi-hua yu tung-chi* (Planning and Statistics), No. 2, February 1960, pp. 18–21.

put and barn yield was not important prior to 1958, but became significant during the initial years of the commune movement when losses in the process of reaping, threshing, gathering, and storing were reportedly large.[46] It is not known whether or not the practice has reverted to biological yield, and if not, whether the post-1960 crop output series has been adjusted to become comparable to those published for the 1950's.

Another aspect of the definitional problem has to do with the Chinese practice of grouping heterogeneous products into one and the same output series. The most infamous example is the inclusion in steel output statistics for 1958 and 1959 of a large amount of steel produced with indigenous methods and generally of unusable quality.[47] Presumably such distortion, perhaps to a much lesser degree than the steel example, also exists in the production statistics published in recent years for chemical fertilizers, cement and other industries where the small-plant program has expanded rapidly. In physical terms, for example, small plants accounted for 54 percent of total nitrogenous fertilizer output[48] and 50 percent of total cement output in 1973.[49] Yet the products of small plants are as a rule inferior in quality. Aggregating the products of both modern and small plants into the same physical output series as if they were homogeneous tends to inflate the output data and yield upward bias over time due to a gradual increase in the relative importance of small plants.[50]

Another limitation of published Chinese data arises from the way in which some of the statistics are presented. The Chinese usually show economic achievements in terms of indexes. The index number problem was well investigated by students of the Soviet economy. The major deficiencies inherent in the Chinese formula for estimating industrial production, which was adopted from Russian usage, has been discussed by Kang Chao[51] and by Field, Lardy, and Emerson.[52] Among them are the following:

(1) In China, the index of industrial production for a particular period was derived as the ratio of the gross value of industrial output at 1952 (and later, 1957) constant prices of the given period to that of the base period. The use of gross value of output as the standard of measurement was likely to result in increased double counting as the complexity of manufacturing processes grew. The use of 1952 or 1957 constant prices would impart an upward bias to the production index since these prices tended to overstate the real prices in later periods when output expanded.

(2) The Chinese practice of pricing new products at starting up prices and keeping their prices at the same level tended to inflate year-to-year increases in industrial production. The problem was particularly serious for those industries in which many new products were produced.

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[46] Choh-ming Li, *op cit.*, pp. 94–96.

[47] The *Ten Great Years* shows that crude steel output increased from 5,936,000 tons in 1957 to 13,690,000 tons in 1958. But 1958 output included 4,160,000 tons produced by native methods during the hectic backyard furnace campaign.

[48] *Peking Review*, Jan. 18, 1974, p. 22.

[49] *Peking Review*, Jan. 11, 1974, p. 23.

[50] The contribution of small industry to the total output of nitrogeneous fertilizers increased from 12 percent in 1965 to 33 percent in 1968, 43 percent in 1971, and 54 percent in 1973. The share of small plants in cement output rose from 24 percent in 1965 to 27 percent in 1968, 40 percent in 1971, and 50 percent in 1973. (*Peking Review*, Dec. 8, 1972; Dec. 15, 1972; Jan. 19, 1973; Jan. 11, 1974; and Jan. 18, 1974).

[51] Kang Chao, *op cit.* chap. 2.

[52] Field, Lardy and Emerson, *op cit.*

(3) Another source of bias was the tendency for local industries to set their prices at relatively high levels compared with centrally controlled industries.

(4) There were frequent changes in definition and coverage of industries without adequate correction in the index.

A problem related to the index number is the choice of the base period. There is a tendency for Chinese statistics to be presented in a misleading way to create the most favorable impression possible. This has been frequently done by publishing percentage increases with relatively low bases, especially 1949. The Chinese economy in 1949 was operating far below its productive capacity as a result of the damages caused by war and inflation. It would be more meaningful to use 1952 as a base, since in that year the nation's economic capacity had been brought back to the prewar level. But for propaganda purposes, the use of 1949 would provide a more favorable picture. As noted above, for example, China's gross value of industrial output in 1971 was shown as 21 times that in 1949. This implies an average annual rate of growth of 15 percent. Using 1952 as the base period, however, the industrial output index for 1971 would become 858 with the average annual rate of growth reduced to 12 percent.[53] Recently published statistics on the gross value of industrial output at provincial and lower levels also were frequently shown as the number of times the 1949 level.

Another example is provided in a statement seen repeatedly in recent Chinese articles: Grain production in China has risen by an average of nearly 4 percent annually, keeping ahead of the population increase which averages about 2 percent a year.[54] This claim is apparently based on official grain production statistics using 1949 as the base period. As table 1 shows, the average annual rate of increase in grain production was only 2.2 to 2.6 percent if the relatively normal year of 1952 is chosen as the base year for calculation.

TABLE 1.—GRAIN PRODUCTION IN THE PRC, 1949–74

Year	Total production (million tons)	Average annual rate of growth	
		1949	1952
1949	108.2		
1952	154.4		
1970	240.0	3.9	2.5
1971	250.0	3.9	2.6
1972	240.0	3.5	2.2
1973	250–257	3.7	2.3–2.5
1974	260.0	3.6	2.4

Sources: 1949 and 1952: Nai-Ruenn Chen, "Chinese Economic Statistics," Table 5.64. 1970: Edgar Snow, "Talks with Chou En-lai: The Open Door," "The New Republic," March 1971. 1971 and 1972: "Peking Review," Nov. 9, 1973, p. 8. 1973: FBIS, vol. 1, no. 193, Oct. 4, 1973, p. B8; and "Ta-kung Pao," Hong Kong, Sept. 6, 1974, p. 1. 1974: FBIS, vol. 1. No. 238, Dec. 10, 1974, p. E–1.

[53] The gross value of industrial output at 1952 prices was 14,020 million yuan in 1949 and 34,330 million yuan in 1952. The derived figure for 1971 was 294,420 million yuan. (Field, Lardy, and Emerson, *op. cit.*)

[54] *Peking Review*, Nov. 9, 1973, p. 8.

TABLE 2.—PUBLISHED INDICES OF CHINESE INDUSTRIAL PRODUCTION, BY PRODUCT, 1970-73 (1965=100)

[Legend: CCTP—Ching-chi tao-pao; CR—China Reconstructs; FBIS—Foreign Broadcast Information Service, Daily Report, People's Republic of China; HC—Hung-ch'i; PR—Peking Review; SCMP—Survey of China Mainland Press (American Consulate General, Hong Kong); TKP—Ta-kung Daily]

Product	1970	1971	1972	1973	Source
Gross value of industrial output	168	192	209	230	Field, Lardy and Emerson, op. cit.
Electric power	171	204		240	PR, Dec. 15, 1974; HC, Apr. 1974.
Crude oil	268	345	400		PR, Nov. 24, 1972; and Jan. 17, 1973; SCMP, Sept. 11, 1973.
Coal	[1] 141		[1] 162		FBIS, Oct. 31, 1973.
Iron and steel				[1] 200	PR, Jan. 11, 1974.
Iron ore			370	380	SCMP, Sept. 18, 1973; PR, Jan. 11, 1974.
Pig iron			320		SCMP, Sept. 18, 1973.
Machine building			[1] 200		PR, Nov. 2, 1973.
Mining equipment		400	490	500	PR, Dec. 1, 1973; FBIS, Sept. 21, 1973; TKP, Sept. 14, 1974.
Metallurgical equipment				550	TKP, Sept. 14, 1974.
Locomotives, passenger coaches and freight cars				400	PR, Feb. 15, 1974.
Tractors		455	500	600	CCTP, Feb. 14, 1973; FBIS, Sept. 21, 1973; CR, Jan. 1975.
Hand-guided tractors			[1] 2,000	3,200	FBIS, Sept. 21, 1973; CR, Jan. 1975.
Internal combustion engines		[1] 320	[1] 400		CCTP, Feb. 14, 1973; FBIS, Sept. 21, 1973.
Bicycles			240		SCMP, Oct. 18, 1973.
Sewing machines			210		Do.
Watches			580		Do.
Electronic products				300	CR, February 1974.
Products of local electronics industry			560		FBIS, July 13, 1973.
Chemical fertilizers		[1] 170	[1] 200	[1] 252	FBIS, Aug. 17, 1973; PR, Jan. 19, 1973 and Feb. 8, 1974.
Insecticide			[1] 200	[1] 226	PR, Nov. 2, 1973; FBIS, Jan. 11, 1974.
Canned food			[2] 200		CCTP, Mar. 7, 1973.
Basketballs, footballs, and volleyballs			260		PR, Mar. 2, 1973.

[1] Indicates more than the figure shown.

[2] Indicates close to the figure shown.

One result of the Chinese publication policy of creating the most-favorable impression possible is, as has been alluded to earlier, the tendency to withhold statistics reflecting difficulties or poor performance. The statistical drought during the 1960's is a dramatic case in point. Most of the statistics published in recent years mainly reported achievements. This can be seen from table 2 which presents the recently published data on the production indexes for various industrial products with 1965 as the base year. With a few exceptions, these indexes were higher than the average growth rates as represented by the indexes for the gross value of industrial output. Therefore, a number of industries not included in table 2 must have experienced lower than the average rates of growth. The fact that no quantitative information has been made availble for the output of these industries is indicative of the policy of withholding information on mediocre performance or failures. Such statistical concealment added to the paucity of qualitative data would make the study of certain sectors of the PRC economy utterly impossible.

The usability of Chinese statistics is limited further in several other ways. As has been mentioned many times throughout this paper, recently published statistics were frequently given in percentages without absolute figures for the base. In some cases, even the base year was not precisely specified. For example, it was merely referred to as "the previous record year," "the early liberation period," or "the last several years." Sometimes figures were shown in imprecise terms such as "approximately," "nearly," "less than," "more than," et cetera. Not infrequently, the growth rates of output were published in terms of ranges.

Occasionally discrepancies existed in the published figures. Some illustrations may be helpful. In the January 5, 1973, issue of *Peking Review*, it was reported that retail sales of TV sets and transistor radios in 1972 rose 50 percent and 80 percent respectively over 1971. Ten months later the same journal gave the respective figures as 56 percent and more than 100 percent.[55] The Kiangsu Provincial Service broadcast from Nanking on July 4, 1973, reported that the gross value of industrial output of Kiangsu Province rose by 150 percent between 1965 and 1972,[56] but the same broadcast on September 29, 1973, indicated an increase of only 140 percent.[57] It is conceivable that as was frequently the case in Chinese statistics published in the 1950's the latter figures could represent an adjustment of the preliminary estimates released earlier. But there were also cases in which discrepancies existed in the figures for the same indicator released at about the same time but by different sources. One example is provided in the reports on the increase in the unit yield of early rice in Yunnan Province from 1972 to 1973. It was 23 percent according to the New China News Agency dispatch in English from Peking on August 11, 1973,[58] but only 12 percent according to the Yunnan Provincial Service broadcast in mandarin from Kunming on the following day.[59] The gap must have been due to errors rather than adjustments. A number

[55] *Peking Review*, Oct. 12, 1973.
[56] FBIS. No. 129, July 5, 1973, p. C1.
[57] FBIS, No. 190, Oct. 1, 1973, p. C4.
[58] FBIS, No. 157, Aug. 14, 1973, p. B4.
[59] FBIS, No. 159, Aug. 16, 1973, p. E3.

of other similar instances may be found.[60] In general, however, such reporting errors appear to be less frequent in national statistics than in local statistics.

All in all, Chinese statistics are fraught with methodological deficiencies and other pitfalls. Figures published in China, therefore, cannot be taken on face value, and should be used with great care. After a decade of statistical secrecy, economic researchers on China welcome recent increases in the flow of quantitative information. With a lot of guesswork and some bold assumptions, the bulk of the recently published data could be put to interesting and meaningful uses. Field's article on national product estimates in a recent issue of the *China Quarterly* is a case in point.[61] Rawski's study cited above is another. With national statistics still scarce, provincial data could provide a useful source for research. Some macro-economic studies could be carried out through aggregating provincial data, as demonstrated in the Field-Lardy-Emerson study and in the work being done in the Economic Research Service of the U.S. Department of Agriculture. Some studies of regional economies also could be done on the basis of available provincial data, as exemplified by some papers in this volume.

VI. Summary and Conclusions

The sources of Chinese economic information stem from both inside and outside China. The amount of such information available has varied over time. During the 1950's qualitative and quantitative economic data were relatively abundant. Subsequently, however, they dwindled in amount until the end of the 1960's. During this period the Chinese government adopted a policy of statistical secrecy while only isolated scraps of qualitative information were published. Since 1970 the publication policy seems to have been relaxed, but the amount of statistics released is not as plentiful as that in the 1950's. Some of these released statistics are relative numbers without an absolute figure for the base, and certain types of data, which were available for the 1950's, have been withheld from publication.

The quality of Chinese data varies for different periods of time and for different economic sectors. In general, Chinese statistics are believed to be internally consistent in view of the close correlation, as demonstrated in a number of studies, between aggregate and disaggregated data, between figures published for different periods of time, and between quantitative and qualitative data.

Internal consistency of published Chinese statistics does not appear to be the result of outright fabrication. There is no evidence to suggest that the central authorities practice deliberate falsification under double bookkeeping. Several considerations indicate the contrary. It is difficult to envisage how a vast country like China with a statistical working force deficient in both quantity and quality could maintain

[60] One instance involved industrial output statistics for Shanghai. It was reported in the New China News Agency Domestic Service broadcast in mandarin from Peking in July 1973 that in Shanghai between 1965 and 1972 the output of 35 horsepower tractors increased by 10 times and the output of hand-guided tractors by 3 times. But these increases were given as 11 times and 3.5 times respectively in the NCNA dispatch in English from Peking in August 1973. (FBIS, No. 135, July 13, 1973, p. C5; and No. 166, Aug. 27, 1973, p. C7).

[61] Robert Michael Field, "Some Overlooked National Product Data," *The China Quarterly*, No. 59, July/September 1974, pp. 583–86.

two sets of national statistics, one for planning and the other for propaganda, without outside detection. A double bookkeeping system would certainly cause confusion among cadres at lower levels and mislead them in making economic decisions. The Chinese Government seems to have adopted a policy of selective publication, withholding information on unfavorable developments and failures, and, therefore, deliberate falsification under double bookkeeping would not be necessary. Also, some of the published Chinese statistics appear to be consistent with the information derived from non-Chinese sources.

Statistical fabrication, however, was and probably still is, practiced by lower administrative echelons. This has affected the quality of Chinese statistics even with corrective measures taken by the central authorities. The general usability of Chinese statistics is limited further by a number of methodological deficiencies and certain peculiar practices.

One of the major difficulties with Chinese statistics has to do with the definition of concept, coverage, and classification. They are often left unexplained. To the extent that they were explained, they were sometimes defined in a peculiar way. Frequently, definitional changes were made without corresponding corrections to the data. In some of the time series data, widely heterogeneous components were grouped together and treated as if they were homogeneous.

Chinese official indexes suffer from many defects. Major defects of the industrial production index, for example, relate to, among other things, the use of gross value output, the choice of price weights, and the treatment of new products. These methodological defects are aggravated further by the tendency to use a low base in order to provide the most favorable impression possible. For the same purpose, statistics reflecting poor performance are usually withheld. For example, the growth rates of various industrial products, for which data were published in the last few years, were as a rule higher than the growth rates of total industrial output.

The usability of Chinese statistics is also hampered by the imprecise way in which the figures were released. Terms such as "nearly," "less than" and "more than" are frequently shown in connection with the published figures, and the base year for indexes is sometimes not precisely specified. Occasionally, more than two different figures were published for the same indicator, and usually no explanation is given as to the discrepancies.

In sum, Chinese statistics in terms of their availability, reliability, and usability are fraught with problems and difficulties. From the vantage point of 1975, the First Five-Year Plan (1953–57), particularly the latter half of it, may be viewed as a golden period for Chinese statistics, although in those years published Chinese data were by no means plentiful or of high quality by the standards of advanced countries. Being kept in statistical darkness for a decade, economic researchers on China in the 1960's were nearly desperate as they reached the point of no return. The gradual resumption of some statistical outflows from China since 1970 has opened new research possibilities. To be sure, there are many deficiencies and pitfalls in Chinese statistics, particularly those published in recent years. With patience, care, and ingenuity one could construct certain meaningful estimates on the basis of the statistics that China has so far made public.

CHINA'S POPULATION: CAN THE CONTRADICTIONS BE RESOLVED?*

By Leo A. Orleans

At the opening session of the United Nations World Population Conference in Bucharest in 1974, Huang Shu-tse, leader of the Chinese delegation, stated that "in the 20-odd years since the founding of the People's Republic, China's population has increased nearly 60 percent from about 500 million to nearly 800 million." This is not the first time Peking spokesmen have referred to "nearly 800 million," but because there is something magical about a figure presented at such a prestigious international conference, it has, for all practical purposes, been accepted by the world community as the official figure for China's population. There are, after all, few alternatives and the general assumption is, of course, that "they" must know and would not make such a statement casually. To those of us who have been more intimately concerned with studying China's population, however, the "nearly 800 million" is no more significant than were the 650, 700, or 750 million figure previously and sometimes interchangeably used by the Chinese. It adds little to our knowledge and is worthless in helping us either make or select alternative projections and estimates. In the light (or obfuscation) of some of the recent Chinese statements regarding population, this paper will attempt to address some of the contradictions and respond to the query: "Where are we now?"

Some Indiscreet Questions

If we eliminate the modifiers—"about," "nearly," "close to"—that precede Huang's figures, we do indeed get a growth rate for China's population of exactly 60 percent. But where did Huang get the figure of 500 million? In Ten Great Years (and elsewhere) Peking reported the end of 1949 population of some 540 milion for China proper.[1] Could "about 500 million" refer to 540 million? Not likely, since a 60-percent increase would then produce a total population of 864 million, rather than "nearly 800 million." Is it not possible that the Chinese revised their 1950 population downward and now consider 500 million more accurate than 540 million? This is again unlikely. It would mean that they have discarded the 1953 census figure of 582.6 million and all other population data published since then. One is therefore led to conclude that either the population is not "nearly 800 million" or that it did not increase by 60 percent since 1950.

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*My since gratitutde to John Aird for his helpful comments; this in no sense implies his concurrence with the analysis in this paper.

[1] *Ten Great Years*, State Statistical Bureau (Peking: Foreign Language Press, 1960). This source reports a population of 548,770,000 including Taiwan. The figure of 540 million is derived by subtracting the population of Taiwan (7,591,298 in 1953) and rounding.

More than a year prior to the Bucharest meeting, Chi Lung, Deputy Representative of the Chinese Delegation to the 29th Session of the United Nations Economic Commission Asia and the Far East (ECAFE) in Tokyo also made a statement that received considerable publicity. At this meeting he said that "over the past 24 years, China's population grew from more than 500 million to over 700 million, an increase of more than 60 percent." [2] These figures were likewise quoted in a number of Chinese sources both before and after the ECAFE conference. Is "more than 500 million" the same as "about 500 million"? Is "more than 50 percent" the same as "nearly 60 percent"? Does "over 700 million" stretch all the way to "nearly 800 million"? These are not trivial questions. If "more than 500 million" refers to the official figure of 540 million for the end of 1949, then a 50 percent increase would certainly bring it to "over 700 million," just as Chi Lung indicated; as a matter of fact, it would raise it to 810 million. It would require only a 30 percent increase to raise it to "over 700 million." And why would a 50 percent increase be reported in 1973 and 60 pecent in 1974? A 10 percent difference in the growth rate represents 50 million people. Surely a statement to ECAFE merits as much judicious consideration as one to the UN Population Conference in Bucharest. As early as 1971 China reported that her population "increased by nearly 200 million people" since the founding of the People's Republic.[3] The same 200 million that was reported in 1973 and 1974? Presumbably during the intervening 3 years the country's population increased by more than the total population of Spain.

There have been numerous other statements made in Chinese publications and by Chinese leaders during the past half dozen years that give rise to still more questions. The list is long but consider just a few of the statements attributed to Chou En-lai. In April 1972 he told British writer Felix Greene that:

> There is no question that the population at present has exceeded 700 million. But there are currently two population figures, one claims to be a little more than 700 million whereas the other claims to be close to 800 million. We tend to belive that it is more than 700 million, but not yet close to 800 million.[4]

Joseph Alsop quotes Chou as saying that he and his Ministry of Health experts think that the present population is "no more than 700 million plus." [5] In August 1972 Chou said to a group of overseas Chinese that his personal feeling is that the population is "around 700 million." [6]

The most curious "official" figure to emerge in the last few years was published in an atlas by the China Cartographic Institute in 1972. It gave China's 1970 population as 685,220,000 [7]— an increase of less than 18 percent since the 1953 census and only 6 percent since the end of 1957, the date of the last officially reported figure. If the Chinese officials had a sense of humor, one might think it was a joke; since they don't, it must be just another example of the casualness with which statistics are handled. Is it any wonder that Westerners in China referred to the Chinese as the "approximate people"?

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[2] *Peking Review*, No. 17, Apr. 27, 1973.
[3] *Ibid.*, No. 40, Sept. 30, 1971.
[4] Sunday Times (London), Apr. 30, 1972.
[5] The Washington Post, Dec. 11, 1972.
[6] As quoted by Loren Fessler in *The People's Republic of China and Population Policy*, American Universities Field Staff, East Asia Series, vol. XX, No. 3, May 1973.
[7] *The New York Times*, June 8, 1972. Derived by subtracting 12,040,000 for Taiwan from 697,260,000.

Perhaps the often-quoted statement by Li Hsien-nien to a Cairo newsman in 1971 [8] and repeated, essentially, in 1972 to the members of a delegation representing Japanese airlines,[9] summarizes the population numbers game best of all. Li reported that the officials at the supply and grain department use a population of 800 million, the officials outside the grain department use 750 million, the Ministry of Commerce "affirms that the number is 830 million," while the planning department "insists that the number is less than 750 million." He concluded that "unfortunately there are no accurate statistics in this connection."

Why No Population Data

There are many people—those who follow China professionally as well as those whose interest in the country is only casual—who insist that the only plausible explanation for all the inconsistencies and contradiction relating to China's population is Peking's desire to hide the facts and confuse the world. They find it inconceivable that a regime able to control the minutest detail of an individual's life is not able to give an accurate count of these individuals. Or a government which, on occasion, can release sophisticated and difficult to obtain economic indexes cannot determine something as "simple" as the size of the country's population. The problem is that most of us who are not professionally involved in organizing and administering population counts and registrations, simply do not appreciate the full extent of the difficulties associated with counting noses—especially Chinese noses. There is no shortage of documentation relating not only to problems encountered by the developing rural societies, but even to those of modern Western nations. Errors in recording and in processing are serious enough in and of themselves, but it has been proven again and again that the basic requirement for an efficient and accurate collection of population statistics is that such data be "gathered for their own sake, rather than as an appendage to some other administrative procedure." [10] This the Chinese have not done since the 1953 census/registration. The population data that are collected have been and continue to be the responsibility of poorly trained local security and other personnel who lack statistical tradition and who have little, if any, appreciation of the importance of these data, which are usually buried in a mass of other economic and social statistics. Aggregates for small administrative units probably adequately reflect local conditions and meet local requirements. Assembling such data for 800 million people scattered over 3.7 million square miles requires the kind of organization and planning that the Peking regime, although capable, has not yet considered necessary to undertake.[11] Personally, therefore, I find no problem in accepting at face value Li Hsien-nien's blunt confession that China has no accurate population statistics. And it is easy for me to appreciate Chou En-lai's

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[8] Daily Report: People's Republic of China, Foreign Broadcast Information Service, Dec. 10, 1971.

[9] KYODO (Tokyo), Aug. 23, 1972.

[10] William Petersen, *Population* (London: Macmillan Co., 1969), p. 47.

[11] This may be as good a spot as any to satisfy an irresistible urge to include the following item: The Government-owned Nigerian newspaper *Daily Sketch* reported on General Yakubu Gowon's 1974 State visit to China. Along with other comments about the trip, the newspaper said that General Gowon would have a lot of useful lessons to learn from China, one of which was how to conduct a census. "With her estimated population of 700 million China has never found it difficult to conduct a census." (*Africa Research Bulletin*, Sept. 1–30, 1974, p. 3380.)

dilemma when he is repeatedly asked by visiting dignitaries the size of China's population. He is not trying to hide or confuse. He simply does not have such a figure, he is only casually concerned about not having it, and he probably wishes people would stop asking him the same "trivial" question.

Neither does Peking know the rate at which the population is growing, because there are no accurate vital statistics for the nation. Births and deaths are registered at the local police station and these data adequately serve such community needs as the distribution of ration tickets and the obtaining of burial permits. As far as we know, however, there is no systematic accumulation of birth and death statistics for large administrative areas, so that neither an accurate numerator (number of births and deaths) nor a denominator (total population) are available for calculating vital rates. Some sample rates are undoubtedly available to the authorities, but local conditions now vary so widely that birth and death rates are likely to be quite different from one locality to another and it is very difficult, even for the Chinese, to generalize from any sample to obtain a realistic national growth rate. Just as in the case of total population, Chinese leaders and Chinese publications refer almost inevitably to the nice round figure of 2 percent as the growth rate, at best prefacing it with the word "approximately." Local birth and death rates brought back by visitors are almost invariably so low as to raise serious questions about their validity. So once again, I am willing to accept the comments of a government official—this time a statement by Hsieh Hua, the "responsible person" in the Ministry of Health. In the summer of 1973, in a direct response to my question, he stated that the State Statistical Bureau, which is responsible for vital rates, is still in a state of flux and that figures for national birth and death rates are still not available in China.

Even accepting the proposition that the Chinese themselves have little more than a vague idea of the size and rate of growth of the country's population, the users of non-Chinese estimates of the mainland's population understandably wonder why there should be such a wide discrepancy between the figures from which they have to select. Doesn't everyone start with the same base population of 582.6 million—the figure reported following the census/registration conducted during the 1953–54 period? Can alternate assumptions, even for a population the size of China's, make a 100 million difference in the projections? The answer to both questions, of course, is yes. All estimates do start with the 1953 figure, and interpretations of developments in China, compounded over a 20–25-year period, do produce large differences in the total population.

Few individuals are so audacious or so pressed by imposed requirements as to attempt to estimate China's population. That is why, although many people have opinions on the subject, for the most part they do little more than react to the handful of figures that are available. They agree or disagree; think a particular estimate is too high or too low; some will even indicate why they feel the way they do. Essentially, they are reacting to just two series of population projections: one is by an anonymous group of analysts in the Population Division of the United Nations, and the other is by John S. Aird of the U.S. Department of Commerce. Let us briefly consider these estimates.

United Nations Estimates

The voluminous demographic statistics published annually by the United Nations (UN) carry all the prestige of that organization and are usually accepted without question. But no matter how expert the staff, the population projections and characteristics for individual countries can only be as good as the basic national data made available to the UN. In the case of China, the United Nations has no special sources of data and the demographers in the Population Division can only struggle with the same data handicaps as does anyone else attempting to work with the population figures for the People's Republic. Over the years numerous projections have been published—each round of estimates based on some revised assumptions regarding China's fertility and mortality, but no new data. The user is almost inevitably presented with high, low, and medium variants to choose from, but it seems that the more recent the estimate, the shorter the methodological discussion accompanying it. For example, figures published in 1964 [12] have almost twenty pages of explanation devoted to China; a similar report published in 1969 [13] has less than a page of general commentary; the response to an effort to obtain anything about the methodology for the most recent UN estimates [14] was: "not available."

The unwillingness of the United Nations to reveal the thinking behind these latest figures is not surprising. Since the People's Republic of China entered the world organization in late 1971, the Population Division has had to face a dilemma. While refusing to provide the UN with any demographic data, China does, apparently, resent the UN's attempt to develop the desired statistics and at the Bucharest World Population Conference demanded that all population estimates for China be deleted from the UN's official documents. This was impossible to do, but due to the pressure applied by Peking, a recently completed special report on China's population prepared by the UN's Population Division was not published "for political reasons."

Table 1 presents the medium variants—the most plausible in the judgment of the UN—of three series of estimates and shows the changes in the thinking that has occurred with regard to vital rates—especially in the assumed death rates. With the passing of time and with the availability of more recent information on the implementation of various policies, changes in projections are inevitable and, when available, the accompanying text is very modest in its claims for accuracy. In addition to the lowering of both birth and death rates between 1968 and 1974, the latest figures incorporate another interesting change. In response to political pressure by Peking, the 1974 estimates include Taiwan in the population of the Chinese People's Republic. The population figure assumed for Taiwan is not given, but it can be calculated. For both 1970 and 1975 the difference between the 1968 and 1974 assessments is exactly 12 million—identical to the population reported for Taiwan by the previously mentioned Peking-published atlas. This, incidentally, is some 4 million lower than Taiwan's official 1975 population. The change is not footnoted or explained and could

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12 *Provisional Report on World Population Prospects, As Assessed in 1963*, Department of Social and Economic Affairs, United Nations, New York, 1964.

13 *World Population Prospects As Assessed in 1968*, Population Division, United Nations, Working Paper No. 30, December 1969.

14 "World and Regional Population Prospects," prepared by the United Nations Secretariat, World Population Conference, Bucharest, Romania, 19–30 August 1974.

cause considerable misapprehension among users who do not recognize the upward revision of the population for what it actually is.

TABLE 1.—UNITED NATIONS ESTIMATES AND PROJECTIONS

[Midyear population figures in millions; vital rates per 1,000 population]

Year	Birth rates a	Birth rates b	Birth rates c	Death rates a	Death rates b	Death rates c	Natural increase a	Natural increase b	Natural increase c
1960–65	34.3			21.0			13.3		
1965–70	32.3	33.1		19.0	15.3		13.2	17.8	
1970–75	30.6	30.2	26.7	17.5	13.4	10.2	13.1	16.8	16.5
1975–80	28.2	27.8	25.3	15.8	11.9	9.4	12.4	15.9	15.9
1980–85		25.9	22.9		10.6	8.6		15.3	14.3
1985–90			19.9			8.1			11.8
1990–95			18.9			7.8			11.1
1995–2000	20.4		18.2	11.2		7.6	9.2		10.6

Year	Total population a	Total population b	Total population c
1960	650		
1965		695	
1970	742	760	772
1975		826	838
1980	843	894	907
1985		965	974
1990	940		1,033
1995			1,093
2000	1,034		1,152

[a] "Provisional Report on World Population Prospects, As Assessed in 1963" Department of Economic and Social Affairs United Nations, New York, 1964. Although the vital rates include the populations of Hong Kong, Macao, and Mongolia their weight is insignificant in terms of the estimated vital rates.

[b] "World Population Prospects as Assessed in 1968" Population Division, United Nations, Working Paper No. 30, New York, December 1969. Medium variant; population figures rounded to nearest million. As in the 1963 assessment, vital rates are for "Mainland Region" which includes Hong Kong, Macao, and Mongolia.

[c] "World and Regional Population Prospects," prepared by the United Nations Secretariat, World Population Conference, Bucharest, Romania, Aug. 19–30, 1974. Medium variant. The population figures include the Province of Taiwan.

Foreign Demographic Analysis Division Estimates

Unlike the United Nations, estimates prepared by the Foreign Demographic Analysis Division (FDAD) of the Bureau of Economic Analysis, U.S. Department of Commerce, are essentially the responsibility of one individual—John S. Aird. As a demographer who has devoted many years to the study of China's population, he contributes both expertise and continuity to his estimates and projections, and his numerous official and unofficial publications clearly set down his assumptions and rationale regarding China's population—past, present, and future. As with all of us in this field, new insights into what has been and new information about what is happening now have caused some modifications in Aird's conclusions and estimates, but basically, his projections continue to represent the higher population ranges for China.

Table 2 presents the latest set of FDAD estimates—the "maximum probability series of population totals." Anyone interested in the rationale behind Aird's estimates can refer to his writings in which he develops his theories and assumptions in considerable detail.[15]

[15] The following references represent a sample of Aird's work: *The Size, Composition, and Growth of the Population of Mainland China*, International Population Statistics Reports, Series P–90, No. 15 (Washington, D.C.: U.S. Bureau of the Census, 1961); "Population Growth," in *Economic Trends in Communist China*, edited by Alexander Eckstein, Walter Galenson and TaChung Liu (Chicago: Aldine Publishing Company, 1968), pp. 183–327; "Population Policy and Demographic Prospects in the People's Republic of China," in Joint Economic Committee, *People's Republic of China: An Economic Assessment* (Washington: Government Printing Office, 1972), pp. 220–331.

In a word, however, his relatively high estimates are attributed to the country's age-sex structure which, because of the large proportion of the population in the reproductive ages, is unfavorable to low crude birth rates, and to his doubts about the success of the Peking regime in convincing China's tradition-bound rural population to delay marriage and practice family planning.

Lacking reported demographic data, the differences between the UN and FDAD estimates obviously boil down to a divergence in the interpretation of a whole range of demographic, social, economic and political developments in China during the past two decades. Even when considering solely the medium ("the most plausible") variant, the difference between the two sets of figures is rather staggering—increasing from some 100 million in 1975 to about 300 million by 1990.

TABLE 2.—FDAD ESTIMATES AND PROJECTIONS

[Population figures in thousands as of Jan. 1; vital rates per 1,000 population]

Year	Population	Birth rate	Death rate	Natural increase
1954	589,173	45.0	21.2	23.8
1955	603,244	44.3	20.1	24.2
1956	617,899	43.4	18.9	24.5
1957	633,045	42.8	17.3	25.5
1958	648,659	42.0	17.6	24.4
1959	664,535	41.1	19.2	21.9
1960	679,058	39.8	23.7	16.1
1961	689,962	38.3	24.9	13.4
1962	699,157	37.8	23.0	14.8
1963	709,473	38.3	19.1	19.2
1964	723,084	38.8	17.5	21.3
1965	738,453	38.8	16.7	22.1
1966	754,747	38.7	16.2	22.5
1967	771,734	38.8	16.1	22.7
1968	789,266	39.4	16.1	23.3
1969	807,609	39.7	15.9	23.8
1970	826,793	39.5	15.5	24.0
1971	846,636	39.1	14.9	24.2
1972	867,079	38.6	14.5	24.1
1973	887,948	38.1	14.5	23.6
1974	909,215	37.6	13.7	23.9
1975	930,916	37.1	13.2	23.9
1976	953,107	36.6	12.9	23.7
1977	975,730	36.0	12.4	23.6
1978	998,799	35.5	12.0	23.5
1979	1,022,308	34.9	11.6	23.3
1980	1,046,127	34.3	11.2	23.1
1981	1,070,337	33.7	10.8	22.9
1982	1,094,898	33.2	10.4	22.8
1983	1,119,823	32.6	10.0	22.6
1984	1,145,180	32.1	9.6	22.5
1985	1,170,979	31.6	9.2	22.4
1986	1,197,243	31.2	8.8	22.4
1987	1,224,014	30.7	8.5	22.2
1988	1,251,289	30.3	8.2	22.1
1989	1,279,004	30.0	7.9	22.1
1990	1,307,272	29.6	7.6	22.0

Note.—A brief explanation of assumptions that produced above figures:

1953–59: In the estimates for 1953 and subsequent years, two substitutions were made for the official data: (1) Because of inconsistencies between the official age-sex structure reported from the census of 1953 and the structure that would be expected on the basis of China's previous demographic history, an alternate age-sex structure as of 1953 generated by computer simultion was substituted; and (2) because of inconsistencies and implausibilities in the official vital rates and population growth rates, assumed parameters for fertility and mortality were substituted. In 1953, it was assumed that the birth rate was 45, the death rate was 22.5, and the natural increase rate was 22.5 per 1,000 population. Thereafter, fertility, as measured by the gross reproduction rate, was assumed to decline by about 3.75 percent between 1953 and 1958 in response to urbanization, internal migration, and mass labor operations. Mortality was assumed to decline by an amount equivalent to an increase of about 6 years in expectation of life at birth.

1960–70: Estimated on the basis of the following assumptions: (1) that the gross reproduction rate declined by a further 7.5 percent from the 1953 level during the crisis years 1959–62, and that mortality rose by an amount equivalent to a drop of about 10 years in expectation of life at birth by 1961, the bottom year of the crisis; and (2) that the gross reproduction rate rose following the crisis, reaching a high point about 5 percent below the 1953 level in 1969 as a result of postcrisis recovery and a wave of youthful marriages during the Cultural Revolution of 1966–68 and then began to decline again because of the resumption of population transfers during 1969–70, and that mortality declined by an amount equivalent to a rise of about 13 years in expectation of life at birth by 1970.

1971–90: Projections based on the assumptions that the gross reproduction rate fell to a level about 8 percent below 1953 by 1972 and will continue to decline at a rate of about 2 percent per year thereafter, and that mortality will decline by an amount equivalent to an increase of about 14 years in expectation of life at birth by 1990.

In some cases even larger differences result in alternate population models prepared by each of the two organizations. Such results are inherent in the use of most models which combine extremes in fertility and mortality trends that are clearly recognized to be more imaginative than factual. Furthermore, the more recent the estimates and the closer the target date, the smaller is the variance between the high and the low projections. Even if these facts are understood by the user, however, they do not help him in making his selection from such wide-ranging projections. These circumstances provide me with an ideal opportunity to express my own views on the subject and present yet another set of estimates of China's population.

Another Set of Estimates

Commenting on some of my earlier estimates [16] an observer wrote that they were "entirely impressionistic and subjective" and therefore "have no demographic value to warrant further discussion." I am convinced, however, that given the lack of hard data, the importance of "feel" based on many years of study on China and her population problems should not be minimized, and in table 3 I again present some slightly revised, but still "impressionistic and subjective" figures. If for no other reason, the unsophisticated method makes it possible for those who disagree with my assumptions to easily pinpoint their disagreements and perhaps make adjustments in line with their convictions.

Since the Cultural Revolution, Peking has been stressing the now generally accepted hypothesis that a primary requisite to a drop in fertility in developing countries is a change in their social, cultural, and economic environment—when people have enough to eat, when the population becomes literate, when the status of women changes and they become more involved in the society and the economy, and when old-age security is assured either through work or through some form of welfare. Such changes occur only slowly, however, and even if China was aware of this relationship in the 1950's and 1960's, she was not yet ready to emphasize it. Although all of these conditions were not yet present, China's high birth rate probably did drop slightly during the 1950's, not so much because of the birth control campaign initiated in the middle of the decade, but because of a certain amount of tampering with the lifestyle of many individuals. Fertility remained fairly stable during and immediately after the Great Leap Forward (1959–61), but then resumed its gradual downward trend until the Cultural Revolution (1966).

[16] See *Current Scene*, vol. VII, No. 24, Dec. 15, 1969, and vol. XIII, No. 3, March 1974.

TABLE 3.—ESTIMATES AND PROJECTIONS

[Population figures in millions as of Jan. 1,; vital rates per 1,000 population]

Year	Population	Birth rate	Death rate	Natural increase
1954	588.0	43	22	21
1955	600.3	42	21	21
1956	612.9	41	20	21
1957	625.8	40	19	21
1958	638.3	39	19	20
1959	651.1	38	20	18
1960	662.8	38	21	17
1961	674.1	38	21	17
1962	685.6	38	20	18
1963	697.9	37	19	18
1964	710.5	36	18	18
1965	723.3	35	17	18
1966	736.3	34	17	17
1967	748.8	34	17	17
1968	761.5	34	17	17
1969	774.4	33	16	17
1970	787.6	32	16	16
1971	800.2	31	15	16
1972	813.0	30	15	15
1973	825.2	29	14	15
1974	837.6	28	13	15
1975	850.2	27	12	15
1976	863.0	26	12	14
1977	875.1	25	11	14
1978	887.4	24	11	13
1979	898.9	23	10	13
1980	910.6	22	10	12

During the mid 1960's, fertility was reacting, in part, to the resumed campaign to postpone marriage and to use contraceptives which were becoming much more readily available—the whole effort being closely tied into the expanding public health system. After another 3-year holding pattern during the Cultural Revolution, the birth rate began to reflect the effects of the mounting national commitment to reduce fertility in the 1970's and should continue to drop by an average of one point per year during the period covered by the estimates. Although the level of 27 births per 1,000 population in 1975 is considerably higher than some visitors to China believe it to be on the basis of some sample figures given them, considering the vast rural population, it represents a significant achievement for the current program to plan births—an achievement Peking can be proud of. Western-style modernization is not likely to come to China in the near future—their developmental goals taking on somewhat different characteristics—but the above prerequisite conditions for a reduced fertility are becoming more and more in evidence, and as long as present priorities persist a continuation of the downward trend in the National birth rate seems inevitable.[17]

The death rates assumed in table 3 are considerably higher than the 17 per 1,000 in 1953 and 11 per 1,000 in 1957 reported by the Chinese. The early priority allocated to the improvement of sanitation and environmental health was, in fact, reflected in a declining death rate, but given the conditions that existed in China before 1949, the shortage of medical personnel and facilities and the size of the widely scattered rural population, the actual reported rates are completely insupportable. The long-term trend of decreasing mortality had only a minor reversal immediately following the Great Leap and a minor

[17] See Leo A. Orleans, "China's Experience in Population Control: The Elusive Model," prepared for the Committee on Foreign Affairs, U.S. House of Representatives, September 1974.

hesitation during the Cultural Revolution. During the Cultural Revolution the Chinese freely admitted that although major diseases were well under control through preventive measures, curative medicine was almost completely inaccessible to most of the rural population. That is why the assumed death rate for the 1960's is somewhat higher than might be anticipated. A major change came about during and after the Cultural Revolution when large numbers of medical personnel were moved from the cities into the countryside to improve the existing health delivery system for the peasants.[18] If China does not experience any major agricultural setbacks, mortality should continue to decline. This decline will be very slow, however, because the level of mortality has already dropped to a level at which further reduction will have to come about as a result of more formidable improvements in curative medicine, rather than by training still more barefoot doctors or by further advances in public health.

Soviet Estimates

It is not unusual to hear the comment that the Soviet Union (not unlike the U.N.) must have some exclusive knowledge about the population of the People's Republic of China. Just why this should be the case is never made clear. Certainly what little is published in Soviet sources does not support such an assumption and the Russians seem to be floundering along with everyone else—with no two sources using the same population figure for China. Of course, when it comes to Soviet research on China, the outside world is able to react only to the tip of the iceberg, but it is indeed doubtful that either the Russian scholars or their intelligence counterparts have any unique sources about Chinese population.[19]

In the 1950's the Soviets had no problems with China's population. They never published any critical analysis of the data and, as any good allies should, used figures released by the Chinese, either from the 1953 census (which was planned and executed with the help of a Soviet specialist) or from some of the other Chinese sources that were then available. During the 1960's—after the break between Moscow and Peking—the volume of Soviet publications on China decreased, but when the occasional need for a population of China came up, they continued to use essentially the same figures they did in the 1950's. Most frequently they used the all-purpose figures of 600 or 650 million or the end of 1957 figure from *Ten Great Years*, but they did start to supplement them with estimates made by the U.N. and Western scholars. On the basis of a reasonably large sample of Soviet sources, it would seem that for the first two decades of the existence of the People's Republic, the Russians did not publish a single estimate of their own on the size of China's population.

During the last half dozen years or so, there has been a basic change in the published works on China in the Russian language. Despite the continuing polemic (now more likely to be concentrated in the first and last chapters of a book or the first and last paragraphs of an article),

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[18] For a detailed discussion of public health and medicine, see Leo A. Orleans, "Health Policies and Services in China," prepared for the Subcommittee on Health, U.S. Senate, March 1974.

[19] In general, visiting Soviet scholars inevitably complain about the gaps in Chinese materials available to them in the Soviet Union and assure us that: "You Americans have more data on China than anyone else."

the number of publications on China and their analytical content have both increased. But when it comes to population, with few exceptions, the customary use of Chinese and Western estimates persists. Typical is a book published in 1973 which devotes some seven pages to population.[20] The author starts out by presenting official Chinese figures through 1957, then moves on to estimates made by the U.N., by "American experts in the Hong Kong Consulate" and others. On the basis of these figures he concludes that in the first 20 years China's population increased by a minimum of 190 to a maximum of 260 million. Not a single Soviet estimate is included in the discussion.

One set of Soviet-produced population estimates appeared in a recent issue of an economic journal [21] in which the author provided the following figures for China's population (in millions): 1949—547, 1957—647, 1965—729, 1971—797, 1972—809 and 1973—820. Although these figures are stated to be taken from a 1972 article,[22] the latter does not have data either for 1972 or for 1973. It does say, however, that the 1965 and 1971 figures were obtained by applying a minimal 1.5 percent annual growth rate to the reported 1957 population. This surprisingly low growth rate was continued for 1972 but, for some reason, it was lowered even further (to 1.36 percent) when projecting from 1972 to 1973. All these rates are, of course, very arbitrary and indicate considerable ignorance of China's population characteristics.

Another example of Soviet estimates—an example that confirms the conviction that somewhere someone is working on Chinese population—is a chapter in a 1972 book on China, written by a Soviet demographer named Konovalov.[23] In this 27-page chapter the author presents what are obviously independent estimates and evaluations of China's population. They are fascinating because they are unique but frustrating because the author includes only the sketchiest explanations as to how the various figures were derived and because of the five sources cited, only one deals with China while three refer to Marx and Lenin. Even a sample of Konovalov's conclusions are quite revealing.

Konovalov states that at present (probably 1970) the population of China is about 780 million; it grew by 130 million during the 1950's and by 70 million during the 1960's. This fantastic discrepancy in the growth during the two decades is attributed primarily to changes in the crude birth rate. In the 1950's the average marriage age went down and the number of births went up, but he does not reveal any of the assumed birth rates. The author believes there was a sharp drop in the birth rate during the 1960's. The marriage age of 25 for women and 28 for men that Peking continues to point to as the ideal the country should strive for is assumed to have become the norm in the 1960's. According to Konovalov this rise in the marriage age reduced the number of births by 30–35 percent, or 7–8 million per year. He refers to a non-existent "legal restriction" to having more than 1–2 children per family as further reducing the number of births by 1.5–2.5 million per year. These measures in conjunction with a strict

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[20] I. N. Naumov, *Prodovol'stvennaya Problema v Kitaye* (*Food Problem in China*), Moscow, 1973.

[21] V. Akimov, "Osnovnyye Napravleniya Izucheniya Ekonomiki KNR i ikh Otrazheniye v Literature" ("Basic Trends in the Study of China's Economy and its Discussion in [Soviet] Literature"), *Ekonomicheskiye Nauki* (*Economic Studies*), No. 1, 1975, p. 121.

[22] V. I. Orekhov, "Zernovaya Problema v KNR" (China's Grain Problem"), *Problemy Dal'nego Vostoka* (*Problems of the Far East*), No. 2, 1972, p. 66.

[23] E. A. Konovalov, "Sotsial'no-ekonomicheskiye Aspekty Problemy Narodonaseleniya KNR" ("Socio-economic Aspects of China's Population Problem"), in M. I. Sladkovskiy, *Sovremennyy Kitay* (*Contemporary China*), Moscow, 1972.

rationing system and continuous malnutrition experienced by the majority of the population have sharply cut the birth rate. He does not say, however, what the birth rate might now be. The author presents many statistics on the age and sex structures of the Chinese population, but without any clues as to the derivation of the figures. Although he estimates the crude death rate to be in the 12–14 per 1,000 range, he believes the average female life expectancy is only 40–42 years—a clear contradiction in his results. And this is just a sample. Each figure relating to either population or labor force raises numerous questions that remain unanswered.

There is no way of knowing whether Konovalov's article is typical of the work that is being done on Chinese population in the Soviet Union or if appropriate footnotes and explanations would make some of his conclusions a little more palatable. Taking the work at face value, however, it would appear that in the Soviet Union, no less than in China, politics plays a dominant role in academic research—a factor which undoubtedly makes the resolution of the many differences between the two countries that much more difficult.

The User's Predicament and Prospects

It is easy to sympathize with anyone who has to pick and choose a particular population figure or series of figures for China, but unfortunately one can offer little more than consolation. It is possible to agree or disagree with some of the assumptions and conclusions and to support either a particular estimate or a divergent point of view, but there is no way to prove that one set of figures is more accurate or more reliable than another. To make matters worse, the producer—or, more accurately, the creator—of the individual estimates is convinced that, despite the handicaps and inevitable caveats, his particular figures resemble Chinese reality more closely than any other.

If the reader accepts the contention that Peking does not really know the size of China's population or the precise rate at which it is growing, then his next logical question must be when are we likely to see new, demographically based figures released by Peking. There are two prerequisites for such an eventuality and, in my view, China shows no inclination to meet either one. First, Peking's leadership must reverse its position, come to the conclusion that accurate population data are necessary and assign a primary priority to the procurement of such figures either by means of a new census or through the creation of a well-organized and closely monitored registration system. Second, the regime must decide in favor of releasing the data obtained to the rest of the world. This would cause considerable embarrassment to China since, whatever the results, Peking could neither rationalize the new figures vis-a-vis those publicized in previous years nor explain them in terms of the political and economic developments since 1953, the year of the first census. Finally, even assuming the unlikely possibility that these two prerequisites were met, would we accept the new data without question or reservation? The arguments, I'm sure, will continue.

There is one compensation, however, for those who attempt to evaluate China's economic and social performance and military potential: no matter what an individual analyst's prejudices might be regarding China's conditions and performance, there will continue to be a variety of population figures from which he will be able to select the one most supportive of his predisposition.

BALANCE IN COASTAL AND INLAND INDUSTRIAL DEVELOPMENT

By CHARLES ROBERT ROLL, JR., *and* KUNG-CHIA YEH*

INTRODUCTION

Many countries in various stages of development contain regions which may be characterized as less developed than other regions within the same country. In China at the time of the establishment of the People's Republic such a situation existed and was of considerable concern to Chinese planners. The coastal regions of China were relatively more industrially developed than the inland areas and Chinese planners set out in the early 1950's to rectify this unequal distribution of industry. The 1950's saw substantial change, but recent data indicate that from 1957 to the 1970's there was little change in the relative shares of the regions in the gross value of industrial output. In the following pages we explore the initial conditions of the 1950's and the scanty data of the 1970's in order to suggest some likely hypotheses for an explanation of this equal aggregate industrial growth.

INDUSTRIAL LOCATION POLICIES, 1949–73

At the time the PRC became the government of the mainland, the economy it inherited can best be described as a composite of two economies: a relatively modern sector engaged primarily in the management of foreign trade and the manufacturing of cotton textiles and certain heavy industrial products, and a traditional indigenous sector. Roughly, the modern sector consisted of seven coastal provinces, and the traditional sector, all the provinces in interior China.[1] The mapping of these two geographical regions into the two dualistic economies is of course imprecise, for in the coastal region there were backward localities (such as northern Kiangsu), and conversely in the inland region there were enclaves of modern industry (such as Hankow and Chungking). But by and large, the separation of the Chinese mainland into coastal and inland areas generally corresponds to its division into two sectors with distinctly different characteristics of economic development.

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*The authors are members of the research staff of the Rand Corp. The views expressed in this paper are those of the authors and not those of the Rand Corp. or its research sponsors.

[1] The 7 coastal provinces are: Liaoning, Hopei, Shantung, Kiangsu, Chekiang, Fukien, and Kwangtung. The inland area includes Kirin, Heilungkiang, Inner Mongolian Autonomous Region, Shansi, Shensi, Kansu, Ningsia Hui Autonomous Region, Tsinghai, Sinkiang Uighur Autonomous Region, Anhwei, Honan, Hupeh, Huan, Kiaogsi, Kwangsi Chuang Autonomous Region, Szechuan, Kweichow, Yunnan, and Tibet.

TABLE 1.—REGIONAL DISTRIBUTION OF LAND, POPULATION, AND INDUSTRIAL OUTPUT, 1952

[In percent]

	Coastal	Inland	Total
Land area	11.4	88.6	100
Population	[1] 39.0	61.0	100
Industrial production	68.4	31.6	100
Pig iron	79.0	21.0	100
Steel	85.8	14.2	100
Rolled steel	82.9	17.1	100
Coal	48.0	52.0	100
Electric power	[2] 90.5	9.5	100
Sulphuric acid	99.0	1.0	100
Metal processing	80.1	19.9	100
Cotton yarn	82.2	17.8	100
Cotton cloth	87.9	12.1	100
Matches	72.7	27.3	100
Machine-made paper	69.4	30.6	100
Sugar	75.5	24.5	100
Wheat flour	63.6	36.4	100
Cigarettes	64.2	35.8	100

[1] Figure refers to total in 1953.
[2] 1947 total, including those for Kirin and Heilungkiang.

Source: N. R. Chen, "Chinese Economic Statistics," Chicago, Aldine, 1967, pp. 123, 132; R. M. Field, N. R. Lardy, and J. P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–73," U.S. Department of Commerce, 1975, p. 16; State Statistical Bureau, "Wo-kuo Kang-tieh Tienli Mei-tan Chi-hsieh Fang-chih Tsao-chih kung-yeh ti chin-hsi" (Past and Present of Iron and Steel, Electric Power, Coal, Machinery, and Paper Industries in China), Peking: Statistical Publishing House, 1958, pp. 5, 41, 140, 187; Tseng Wen-ching, "Chung Kuo-ti She-hui chu-i Kung-yeh-hua" (The Socialist Industrialization of China), Peking: People's Publishing House. 1957: pp. 256–257.

One important feature of the dualistic development was the high degree of concentration of China's economic activities and population in the coastal region, particularly in the cities. As shown in table 1, in 1952 its industrial output (including handicraft output) constituted 68 percent of the national total. The gross value of output of eight cities (Peking, Tientsin, Shanghai, Shenyang, Anshan, Luta, Fushan, and Penhsi) in turn accounted for about 55 percent of the total for the coastal region.[2] If handicraft output is excluded from the total, the coastal region's share of industrial output would be still higher—close to three-fourths of the total.[3] In all the 14 principal industries shown in table 1 (except coal), the region produced more than 60 percent of national output. The concentration of cotton textiles and heavy industries in this region was particularly striking.

The spatial distribution of agricultural resources also heavily favored the coastal region. The seven coastal provinces took up only 11 percent of the total land area. Yet their cultivated land accounted for 33 percent of total cultivated area in China.[4] Moreover, these included some of the most fertile land in China, particularly areas in the delta of China's major rivers, the Liao Ho, Yellow River, Tangtze Kian, and Pearl River.

Not only industrial and agricultural resources were highly developed in the coastal provinces, so was railway transportation. In 1949/50, about 42 percent of the operating railway trunk lines in China were in the coastal region.[5] Its railway mileage density was more than five times that of the inland region.

[2] Field, Lardy and Emerson, *op. cit.*, p. 16 and Sun Ching-chih, *Tung-pei ti-chu ching-chi ti-li* (Economic Geography of the Northeast Region), Peking: Ko-she Publishing House, 1959, p. 31.
[3] *Chi-hua ching-chi* (Planned Economy), No. 8, 1957, p. 13.
[4] Chao Kang, *Agricultural Production in Communist China, 1949–1965,* Wisconsin: University of Wisconsin Press, 1970, p. 295.
[5] Yuan-li Wu, *The Spatial Economy of Communist China,* New York: Praeger, 1967, pp. 244–245.

The relatively large and fertile agricultural area both supported and needed a fairly high concentration of population in the coastal region. About 40 percent of China's total population resided in this region. The population density was about five times that of the inland area. Also, because of the concentration of industrial activities, the degree of urbanization was much higher. Of the nine cities with population of 1 million or over in 1953, six were in the coastal region.[6] Close to one-half of the 101 cities with population of 100,000 or over were located in the coastal region.

From the standpoint of the Chinese leadership, the pattern of development was "irrational" for the following reasons. First, in the event of a direct military confrontation with a foreign power that is superior in air and naval power, the coastal provinces would be highly vulnerable, and the destruction of the industries in these provinces would mean the loss of a large part of China's industrial capacity. Second, industries in the coastal region had been importing raw materials (e.g., cotton and tobacco) from the inland areas and exporting the manufactured products (cotton cloth and cigarettes) to the inland area. The transportation costs of shipping raw materials and products back and forth could have been saved if the manufacturing plants were located where the raw materials and markets were. Third, resources in the vast inland area had been left unexplored or underdeveloped.

Accordingly, in planning the location of new industries, the Chinese leadership had three basic objectives: to reduce vulnerability of production sites to possible external attack, to lower transport cost by building new plants near markets and raw material and fuel-producing areas, and to develop the economically backward areas in the interior.[7] However, there were conflicts between these objectives. Furthermore, there were other development goals, not the least of which was a relatively high rate of economic growth. Clearly, there were trade-offs between optimum industrial location and maximum growth. The benefits from establishing a new industrial center in the interior in terms of less vulnerability or lower transport costs would have to be balanced against a relatively larger investment in social overhead capital and a lower rate of industrial growth in the short run. Similarly, the exploitation of resources in the inland provinces might bring benefits only at the expense of economies of scale from the existing plants in the coastal area. Basically, the trade-off was between short-term and long-term gains and between economic and noneconomic benefits. Because of these conflicting goals, questions of preferences and priorities arose, even though there was no dispute over the need to develop new industries. The choice was between allocating various proportions of total investment to each region, between expanding the productive capacities of existing plants and constructing completely new plants, between various production sites, and between constructing a smaller number of large plants in a few industrial centers or a larger number of plants dispersed over many localities. Here the

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[6] Morris B. Ullman, *Cities of Mainland China: 1953 and 1958*, Washington, D.C.: U.S. Department of Commerce, 1961, p. 2.

[7] Li Fu-chun, "Report on the First Five-Year Plan," in *Chung-hua-jen-min kung-ho-kuo fa-chan kuo-min ching-chi ti-yi wu-nien chuhua* (The First Five-Year Plan for National Economic Development of the People's Republic of China), Peking: People's Publishing House, 1955, p. 188.

leaders were divided. Some favored spatial dispersion on military and political grounds and opted for immediate development of the interior; others emphasized greater economic efficiency in locational planning and opted for development of the old industrial base.

During the period 1949–70, the leadership's regional policy vacillated. Broadly speaking, one can distinguish five phases of regional development during this period: the rehabilitation and First Five-Year Plan in 1949–57; the Great Leap and crisis in 1958–60; the Liuist period of 1961–65; the Cultural Revolution in 1966–69; and the post-Cultural Revolution period since 1970.

In the first 3 years of the regime, the planners hardly had any regional development policy to speak with. The administrative machinery for the centralized control of resources had just been set up. The leaders were concerned primarily with restoring production and price stability. Rehabilitation hardly began when the PRC was involved in the Korean War. The war inevitably brought severe strains on the economy so that the resources mobilized for development were relatively small.[8] The priority at this stage was to rebuild the plants in Manchuria that had been dismantled by the Russians. It was not until the early 1950's when the First Five-Year Plan was being drawn up that locational planning was seriously considered. The Plan clearly favored a shift of industrial activity to the interior. Of the 694 major projects to be started during 1953–57, more than two-thirds were to be located in the inland area.[9] During the first 3 years of this period (1953–55), investment in the inland area accounted for 55 percent of the total, compared to about 50 percent during 1950–52.[10] The new industrial centers to be developed included Lanchow, Tai-yuan, Sian, Loyang in northwest, north and central China. Provinces in the southwest and south China were assigned lower priorities.

Toward the end of the FFYP period, Mao had some second thoughts. In his major policy speech on the 10 important relationships in early 1956, he pointed out that during the past few years the coastal industries had been unduly neglected and that this should be corrected.[11] He still believed that 90 percent or more of the projects in heavy industry should be located in the inland. But to do so, greater emphasis must be placed on the industrial centers in the coastal region. The rationale was that output and therefore profit of the state enterprises could increase more rapidly by fully utilizing and expanding the industrial capacity in the established centers; the latter could then provide the resources including capital, skilled labor, and new technology for developing the industrial centers in the interior.[12] In essence, Mao's reasoning resembled the turnpike theorem in growth theory which states that it will be more efficient for an economy to expand along a path towards the optimal von Neumann growth path even though this involves moving away from the desired path for

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[8] According to an estimate by Hollister, state investment in 1950–52 amounted to only 3 to 8 percent of GNP. William W. Hollister, *China's Gross National Product and Social Accounts 1950–1957*, Glencoe, Ill.: The Free Press, 1958. pp. 12–13, 128–129.

[9] Li Fu-chun, *op. cit.*

[10] *Tung-chi kung-tso* (Statistical Bulletin), No. 21, 1956, p. 6.

[11] *Mao Tse-tung Ssu-hsiang Wan-sui* (Long Live Mao Tse-tung Thought), Peking, 1969, pp. 43–45.

[12] For specific examples of lower marginal capital-output ratios and shorter gestation periods for investment projects in the coastal area, see Li Fu-chun, "Implementation of the First Five-Year Plan," *Hsin-hua pan-yueh-K'an* (New China Semi-monthly), No. 14, 1956, p. 50.

some period of time.[13] In the present case, it would mean that given a long enough time horizon, industrialization of the inland area could be achieved faster by allocating more resources to the coastal area during the initial period even though it might slow down the industrial growth of the inland area for the time being.

Mao's speech signalled a major change in location policy. In his report before the Third Session of the First National People's Congress in June, Li Fu-chun reaffirmed the long-term goal to relocate industrial capacities to the inland but emphasized the need to rely on the coastal industries for the supply of consumer's goods, technical equipment, and capital.[14] He therefore called for more investment to expand the productive capacities of the existing industries. The same policy was clearly stated in Liu Shao-chi's and Chou En-lai's reports before the Eighth Party Congress in September and in the draft Second Five-Year Plan.[15] As a result, considerable development in the coastal industries took place in 1959–60.[16]

During this period, another major change in investment policy was in the making. The same policy statements cited above also called for greater emphasis on medium-sized and small plants. To implement this policy, a series of regulations to decentralize decisionmaking were promulgated in late 1957. Subsequently in 1958, again at the initiation of Mao, a vigorous program to develop small, indigenous plants raged all over the country. The program centered around the construction of backyard furnaces, but small projects in virtually all kinds of industries were built. Few, if any, leaders objected to the new focus on small factories. But some, like Chen Yun, questioned the wisdom of massive, uncoordinated development simultaneously on all fronts.[17] Had the Great Leap in small plants succeeded, it would have increased appreciably the share of industrial production of inland provinces. But, it failed disastrously. Meanwhile, Sino-Soviet relations took a sharp turn to the worse. In July 1960, the Soviet Union abruptly recalled all its technicians in China, forcing many construction projects to come to a halt. A large number of these projects were located in the inland region. The impact of the Soviet withdrawal on the inland region was probably greater than on the coastal area. Thus on the whole, it appeared that only limited change in the geographical distribution of production capacities in this period had taken place.

In the period after the Great Leap, the urgent problem was economic recovery and consolidation. Because the economic crisis was essentially a crisis in the agricultural sector, a new policy of developing industry to support agriculture was adopted. This meant higher priority in resource allocation for the chemical and machinery industries that were mainly located in such coastal provinces as Kiangsu, Hopei, and Liaoning. In the allocation of industrial inputs to agriculture, areas with high and stable grain yields and areas growing the major economic crops were the favored areas, such as the Yangtze, Pearl, and

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[13] Robert Dorfman, Paul A. Samuelson, and Robert M. Solow, *Linear Programming and Economic Analysis*, New York : McGraw-Hill, 1958, pp. 329–335.

[14] Li Fu-chun, "The Implementation of the First Five-Year Plan," *Hsin-hua pan-yueh-k'an* (New China Semi-monthly), No. 14, 1956, pp. 46–51.

[15] Liu, Shao-chi, "Political Report," Chou En-lai, "Report on the Second Five-Year Plan," and "Proposal for the Second Five-Year Plan," *Hsin-hua pan yueh-k'an,* (New China Semi-monthly), No. 20, 1956, pp. 10, 41–42, 166.

[16] Mao, *op. cit.*, p. 355.

[17] Chen Yun, "Several Major Problems in the Current Capital Construction Work," *Hung-chi* (Red Flag), No. 5, 1959, pp. 1–16.

Yellow River delta. For the industrial sector itself, the major problem appeared to be one of technology. The abrupt cutoff of Soviet technical aid had slowed down the growth in China's capability to design, build, and operate the modern plants. To close the technological gap, the Chinese relied heavily on their own research and development effort and on technological diffusion within the economy. Under the circumstance, the technical manpower in the coastal industrial centers provided the nucleus for the self-reliance program.[18] Thus the priority region shifted to the old industrial base in the coastal area, although some major projects were completed during this period in the inland area, including the gaseous diffusion plant near Lanchow and the iron and steel complexes in Pao-tao and Wu-han.

The period of the Cultural Revolution in 1966–69 was a chaotic one so far as economic management was concerned. Little is know about location policies during this period. But the general trend was clearly toward greater emphasis on political rather than economic goals. Liu Shao-chi's policies that stressed economic efficiency and the old industrial bases had been openly criticized and eventually abandoned. Of the 57 major projects completed durıng 1967–70, only 23 were in the coastal region.[19]

The year 1969 marked a major turning point for China's domestic and foreign policies, partly because a less conservative group replaced the leadership under Liu, but mainly because of a sharp deterioration of Sino-Soviet relations following repeated military clashes along the border in 1969. As part of the preparation against a possible war with the Soviet Union, a new small-plant campaign was launched to support the drive toward local self-sufficiency.[20] Whereas spatial dispersion was the consequence of the small-plant campaign in 1958, it was made a major goal in 1969. These local industries were developed in all parts of the country, probably resulting in a larger share of industrial output in the 18 provinces and autonomous regions in the interior. The emphasis on the interior was also evidenced by the construction of two railways in the southwest. Another significant development in this direction was the phenomenal growth of Ta ching Oil field in Heilungkiang. Offsetting this trend to a limited extent was the development of the Shengli Oil field in Shantung and the Takang Oil field near Tientsin. But on balance the shift of emphasis appeared to be toward the inland area.

Thus, by the early 1970's, China's location policy had completed its first pendulum swing. What began in the 1950's as a deliberate policy to locate industrial plants in the inland area had been interrupted by the Great Leap and later modified by the leadership in the early and mid-1960's. Then, in the early 1970's, the emphasis on war preparation again shifted the attention to spatial dispersion in the interior. Only this time, the principal objective seemed to be the development of the central-south, southwest, and northwest regions.[21]

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[18] The coastal area had long been a major source of supply of technical manpower. For example, during 1949–55, Shanghai provided 200,000 workers and technicians to other areas. *Tung-chi Kung-tso* (Statistical Work) No. 21, 1956, p. 6.

[19] Chien Yuan-heng, "An Analysis of Chinese Communist Work in Capital Construction," *Chung-Kung yen-chiu* (Studies on Chinese Communism), vol. 7, No. 5, May 10, 1973, pp. 67–68.

[20] "China will have big and small reliable industrial bases scattered all over the country, and should U.S. imperialism or Soviet revisionist Socialist-imperialism impose a war on China, it would have greater maneuverability and each locality could conduct the war independently, wipe out the enemy and win." Peking Revolutionary Committee, "The Road for China's Socialist Industrialization," *H'ung-chi* (Red Flag), No. 10, 1969, p. 31.

[21] Cheng shih, *A Glance at China's Economy*, Peking: Foreign Languages Press, 1974, p. 32.

PATTERNS OF POPULATION AND INDUSTRIAL CONCENTRATION

Statistical evidence of the outcome of the changing policies is hard to come by. Only two fairly complete provincial series on population by John Aird and industrial output by Field, Lardy, and Emerson are available. Table 2 shows the pattern of population distribution in selected years during 1953–73. One striking feature in the pattern stands out: The distribution of population between the coastal and inland areas hardly changed in the last two decades despite the emphasis on the interior. The share of total population in the coastal area remained at 40 percent throughout the period.

When we turn to the individual provinces, however, some changes are discernible. Within the coastal region, the shares of Liaoning and Hopei increased while those of the other five provinces all declined. In the inland region, only the shares of Kirin, Heilungkiang, Inner Mongolia, Kansu, Shensi, Sinkiang, and Tsinghai went up. The overall pattern shows that provinces in the Northeast, North, and Northwest China experienced a more rapid rate of population growth than the rest of China. All but three of the nine provinces lie on the Sino-Soviet border.

The population trend in the three municipalities (Peking, Tientsin, and Shanghai) had been clearly upward and their rates of growth were much faster than total population as the following figures show: [22]

[Percent, 1953=100]

	1957	1970
Peking	144.8	273.3
Tientsin	119.7	159.1
Shanghai	111.3	174.5
National total	110.0	143.6

TABLE 2.—GEOGRAPHICAL DISTRIBUTION OF POPULATION BY REGION, 1953–73

	1953	1957	1965	1970	1973
Coastal area	39.9	40.0	40.0	40.0	40.0
Liaoning	3.8	4.0	4.3	4.5	4.6
Hopei	7.3	7.3	7.4	7.5	7.5
Others	28.8	28.6	28.2	28.0	27.9
Inland area	60.1	60.0	60.0	60.0	60.0
Heilungkiang	2.2	2.4	2.8	3.0	3.1
Kirin	2.2	2.2	2.2	2.2	2.2
Inner Mongolia	.6	.7	.7	.8	.8
Kansu	2.2	2.3	2.3	2.4	2.4
Sinkiang	.8	.9	.9	.9	1.0
Tsinghai	.3	.3	.3	.4	.4
Shansi	2.7	2.8	2.9	2.9	3.0
Others	49.0	48.6	47.9	47.4	47.1
Total	100.0	100.0	100.0	100.0	100.0

Source: John S. Aird, "Population Estimates for the Provinces of the People's Republic of China: 1953–74," Washington, D.C.: U.S. Department of Commerce, 1974, p. 23. Individual items do not add up to the totals due to rounding.

[22] The indexes are based on figures given in: M. B. Ullman, *Cities in Mainland China: 1953 and 1958*, U.S. Department of Commerce, Washington, D.C., 1961, p. 2; *New York Times*, Mar. 20, 1973; John S. Aird, *op. cit.*, pp. 9, 23. Part of the increase reflected changes due to enlarged boundaries.

The indexes suggest that population in these three major cities is more highly concentrated in the 1970's than in the 1950's.

The distribution of industrial production between the coastal and inland regions is somewhat similar to total population. As table 3 shows, there had been a slight shift away from the coastal area during the First Five-Year Plan period. More interestingly, this was followed by a more or less balanced growth since 1957. The same observation can be made about the three municipalities. Their share of industrial output also remained more or less constant throughout the period.

Three important complications in this comparison should be noted. First, the Chinese Communist method of compiling gross value output is such a change in the degree of vertical integration of the production process would affect gross value of output even though value added by the same process remains unchanged. It is not clear whether the degree of vertical integration had changed, and if so, in what direction and to what extent it has affected the estimates. Second, changes in the quality of products over time might have distorted somewhat the distribution pattern. For example, the quality of steel, cement, coal, and chemical fertilizer produced by the local industries might well be of inferior quality and unless the quality differences had been fully reflected in the relative price weights, gross value of output of the region where local industries were more important would probably be on the high side. Third, in the last two decades or so, many regions produced commodities new to the region but not necessarily to the other region. Among them were many products produced and consumed locally. For these products, prices were set by the provincial authorities generally on the basis of average-cost-plus methods.[23] And, because costs are generally higher at the initial stage of development than at a later stage, the gross value of output would be biased in favor of a latecomer, even if physical outputs in both the new and the established region increase at the same rate.[24] For lack of information, it is difficult to say to what extent changes in industrial organization, quality products, and valuation of new products had affected the distribution pattern. In our judgment, any distortion of the picture would probably be rather small.

TABLE 3.—GROSS VALUE OF INDUSTRIAL OUTPUT BY REGION, 1952–73

[Percent of national total]

	Coastal			
	Peking, Tientsin, and Shanghai	Other coastal area	Total	Inland
1952	26.9	41.4	68.3	31.7
1957	25.2	39.2	64.4	35.6
1965	27.4	38.5	65.9	34.1
1970	28.1	37.6	65.7	34.3
1973	27.0	37.1	64.1	35.9

Source: R. M. Field, N. R. Lardy, and J. P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–73," U.S. Department of Commerce, Washington, D.C., 1975, p. 16. The figures for Shantung in 1965, Hopei and Chekiang in 1965, 1970, and 1973 are lacking. We assume that they increased at the same rate as those for the provinces for which data are available (calculated in 1952 prices).

[23] N. R. Chen, *Chinese Economic Statistics*, Chicago: Aldine, 1967, pp. 80–81.
[24] N. R. Chen, *op. cit.*, p. 38.

TABLE 4.—SHARE OF TOTAL OUTPUT PRODUCED BY COASTAL PROVINCES, 1952–70

[In percent]

	1952	1957	1965	1970
Electric power	65.7	60.1	54.0	56.7
Coal	34.4	35.6	35.5	40.4
Crude oil	75.0	40.0	16.2	13.3
Steel	84.6	83.3	63.6	55.5
Chemical fertilizer	100.0	87.5	48.9	50.0
Cement	72.4	62.3	40.9	36.1
Paper	50.0	44.4	40.0	38.9
Machine tool	90.0			79.6
Cotton cloth	81.6	70.0	61.1	61.3
Sugar	40.0	33.3	46.7	47.1

Source: Field, op. cit., p. 84; "People's Republic of China—Atlas," Central Intelligence Agency, 1971, p. 68.

The broad pattern of regional balanced growth is all the more striking if we examine the regional distribution of output of 10 major products shown in Table 4. With the exception of coal and sugar, the shares of all the items produced in the coastal region went down continuously during 1952–70. The shares of crude oil, steel, chemical fertilizer, and cement show the most marked decline. The decreasing importance of oil in the coastal region was due to the rapid expansion of crude oil production in Yumen and Karamai oil fields and subsequently, in the Taching Oil fields. In the case of steel, the decline reflected the growth of the new production centers in Paotao and Wu-han. The coastal region's cement and chemical fertilizer output lost ground mainly because of the development of new industries to support agriculture in the inland region.

Not surprisingly, the picture suggested by Table 4 has led some students of the Chinese economy to conclude that a change in the regional distribution of industry had taken place. While this was true for a number of products, it was not true for industrial production as a whole. Total industrial production in the coastal and inland regions grew at about the same rate during 1957–73.

Balance in the Aggregate

In the preceding sections we have sketched a picture of the likely investment policies within China. These policies can be crudely summarized as either favoring the inland areas or treating both inland and coastal areas neutrally. On the other hand, we have presented empirical evidence to suggest that the distribution of the gross value of industrial output did not change between 1957 and the 1970's, even though some of the physical output series available did move in favor of the inland areas. The question then is: Why this "balanced" aggregate growth? We propose to attempt to infer an answer to this question that may be considered (at best) speculative since the data available are not sufficient to support any truly analytic exploration. In our opinion, however, the reason for such a growth pattern in gross industrial output is probably due to imbalanced investment in inland zones in the more slowly growing and traditional industries—especially textiles, and reliance on coastal industry for intermediate inputs and investment funds and goods. Before presenting the evidence for such an opinion, though, the term "balance" must be more fully explored.

We have loosely referred to the growth of the gross values of industrial output in the coastal and inland areas as being "balanced." This term, in our usage, is no more than an algebraic expression indicating equality. "Balanced growth" is, however, a particular term in economic designed to facilitate the expression of something akin to harmony in growth, no bottlenecks, or ex ante equality between savings and investment. In fact, the term, balanced growth, means different things to different scholars.[25] We do not wish to go deeply into this topic, but simply will indicate that to Chinese planners the term balanced growth would probably mean balance in an input-output manner.[26] What this means in a practical sense is an economic plan drawn up on the basis of balancing intermediate input demands so that desired final demands can be met. Thus, following the Great Leap Forward, the change in policy toward emphasis on industry supporting agriculture and the relationship between agriculture and the inputs it supplies to light industry may be thought of as a turn toward a balanced growth policy.

THE SOURCES OF BALANCE

In an analysis of the regional equality of the gross values of industrial output, one would want to know (at a bare minimum) the production structures of the regions, the incremental capital/output ratios of each of the important industries within the regions and the distribution of investment by industry and by region over the period of analysis. Thus, one could calculate the "sources of growth" within regions and thus, a la Dennison, "explain" the growth of the gross value of output in a crude way. Of course, this procedure would ignore the differential growth of each region's labor force, both quantitatively and qualitatively. This would not seem too important, from the quantity side, since relative population growth has been about constant. Some importance could be attached to quality changes, and the coastal area more likely benefited in this regard despite the supply of educated youths sent to the countryside. However, we do not know what changes in the capital stocks occurred and these variables are the keys to sorting out the sources of growth.

We do, however, have some record of the shift in the sectoral balance of production. Light industry's share in total gross industrial output declined from about 50 percent in 1957 to 30 percent in 1973.[27]

Thus, heavy industry was the major source of growth over the period, about 12–13 percent average compound growth per year. Light industry grew at about 6 percent per year. Such a pattern of growth is not surprising. Despite emphasis on agriculture, agriculture has been growing slowly and consequently the great majority of inputs into light industry (agricultural products) grew slowly, thus con-

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[25] See, for example, Warren Frederick Ilchman and Ravindra C. Bhargava, "Balanced Thought and Economic Growth," *Economic Development and Cultural Change*, XIV, No. 4 (July 1966), pp. 385–389.

[26] See Kenneth Walker, "Ideology and Economic Discussion in China: Ma Yin-Ch'u on Development Strategy and His Critics," *Economic Development and Cultural Change*, XI, No. 2, pt. I (January 1963), pp. 113–133.

[27] *China Reconstructs*, December 1974, p. 21, reported Light Industry Output Value in 1973 as over 10 times that for 1949. We have taken consumer goods output as a proxy for light industry (*Ten Great Years*, Foreign Languages Press, Peking, 1960, p. 87) even though some light industry outputs are producers' goods. The shares for 1957 are derived from *Ten Great Years*, and for 1973 by dividing ten times 1949 consumer goods output by the total gross output value reported by Field, et al., *op. cit.* for 1973. We think the changing share so computed is illustrative of the general magnitude of change.

straining the rate of growth of light industry. Growth in heavy industry increasingly dominated aggregate industrial growth over the period 1957–73. Moreover, the leading subsector within the heavy industry sector, with an average compound rate of growth between 1957 and 1971 of about 20 percent per year, was the machinery industry.[28]

Clearly, differential patterns of growth in the machine-building industry could go a considerable distance in reconciling the aggregate equal rates of industrial growth with the physical output series in table IV above. If one assumes that the coastal area produced 78.6 percent of the machine tools in 1957 as well as in 1971 [29] and if one further assumes that this share is a good proxy for the value share of machinery output in 1970, then machinery output alone accounts for about 42 percent of the increment in coastal industrial output—assuming, of course, equal rates of growth in the coastal and inland areas.

If one employs 1952 prices and performs a similar calculation with the physical output series given in table IV, only 7 percent of the increment in output from 1957 to 1970 is explained for the coastal areas, but 30 percent is accounted for in the inland area.[30] Adding the machine building and other increments together, one can plausibly suggest that about 50 percent of the increment is accounted for in both inland and coastal areas and, thus, and more surprising, the yet to be identified portion of output in each region grew at about the same rate in each region. Of course, this conclusion rests on the assumption that coastal and inland machinery output grew at fairly equal rates over the period, and that physical output of machine tools could serve as a crude proxy for machinery output value. Thus, our calculations should be viewed not as exact magnitudes, but more as illustrative calculations of the probable sectoral and regional trends within the gross value of industrial output.

In our rather crude calculation we have discovered that adding machinery output offsets the movements in favor of the inland areas that the physical output series reveals. However, the regional output value of these items, when one includes machine building, was only about 20 to 25 percent of total regional output. Further, the portion of output we have described as "yet to be identified" must remain unknown because of lack of data. Nevertheless, some interesting insights can be gained from what so far has been a purely algebraic manipulation of scanty data.

First, we point out that if oil had not been included in the physical output series then the identified growth in the inland area would have been substantially reduced. Two factors are clear from such a consideration. First, it is evident that new and fast growing industries that enjoy sustained growth can considerably influence movements in the regional distribution of output. The growth in oil points out the more capricious nature of regional development in that natural endowment can play a large role. To be sure, perhaps even larger roles are played by consumption demands and transportation costs, but the location of reserves is clearly important. Second, the calculations provide us

[28] *We Are in the Midst of Advancing* (Wo-men Cheng-tsai Ch'ien-chin) People's Publishing House, Peking, 1972, p. 55. Machinery output in 1971 was reported to be about 13 times that of 1957.
[29] Field, *op. cit.*, p. 84.
[30] Prices taken from T. C. Liu and K. C. Yeh, *The Economy of the Chinese Mainland*, Princeton, 1965.

with some empirical evidence for the construction of some suggestions concerning the reasons for the regional balance in aggregate output.

The first hypothesis that might be used to explain the regional balance in growth despite the unbalanced investment in favor of the inland region is that the pattern of investment in the inland areas, especially during the First Five-Year Plan, the period of probable greatest imbalance, was confined to either high capital output ratios or to industries that were destined to grow slowly for various reasons. One cannot even speculate on the pattern of investment in heavy industry for lack of data. However, we do have some knowledge of the textile industry. After liberation much of the discussion concerning the "irrational" distribution of the industry was focused on the textile industry. As a result, by the 1970's the cotton textile industry's capacity in inland areas had increased from 10 to 20 percent in about 1949 to 45 percent of total industry capacity.[31] Such an increase was due not only to new investment but also to the movement of production facilities into the interior.[32] The textile industry depends on agriculture for its material inputs, particularly cotton, and, since the rate of growth of agriculture has been slow, this has invariably constrained the rate of growth of textile output.

Second, beginning in 1955–56, as we have pointed out above, increased emphasis was placed on the full utilization of coastal areas in support of inland development and for more cost effective increases in production. Then, following the Great Leap Forward, increased emphases were placed on industry to provide inputs for the support of agricultural development. We think that the inevitable results of such policies were derived demands for intermediate inputs and investment goods on the part of inland industries and on the part of agriculture that stimulated output growth in the coastal areas. Thus, initial development policies favoring the interior and later agricultural policies created derived demands for growth in the coastal area. It is interesting that just such a counterintuitive result occurred in Italy during the 1950's when development policies favoring the south created demands in the north and center that stimulated output in the two more industrialized regions.[33]

A third factor possibly aiding the growth of the coastal regions may have been the campaign for "self-sufficiency" that has received continuing emphasis since about 1965, although mentioned in the early 1960's. In the production sphere the intent of the campaign is to produce more locally self-sufficient production centers. For example, if a city specializes in heavy industry, it is to develop light industry. Given the skilled labor force and the well-developed industrial infrastructure in the coastal area, it may have been easier (that is, required less investment) for the coastal regions to move ahead in the establishment of new industries or in the creation of additions to existing capacity. Further, in this vein one could also speculate that the continuing demand for new products and new technology has naturally fallen to the coastal areas to fill, given the coastal area's comparative advantage in human capital over the interior.

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[31] *We Are in the Midst of Advancing*, op. cit., p. 75.

[32] More than 90 mills were moved inland from Shanghai during the period 1949–73. *Peking Review*, Jan. 17, 1975, p. 12.

[33] Hollis B. Chenery, "Development Policies for Southern Italy," *The Quarterly Journal of Economics*, LXXVI, No. 4 (November 1962), pp. 515–547.

Conclusions

In summary, it is our opinion that several factors have led to equal aggregate output growth despite an investment balance in favor of the interior. These are input contraints in the textile industry, derived demands for coastal output generated by inland industries and agriculture, emphasis on self-sufficiency and new product output. At our current state of knowledge about the Chinese economy these opinions must be considered hypotheses rather than explanations. We have sketched out, in a rudimentary fashion, the initial conditions in the coastal and inland regions, Chinese policies with respect to development within these regions and the scanty evidence available about coastal and inland changes. These scanty data have led us to suggest certain hypotheses concerning the revealed equality in the regional growth of aggregate gross industrial output. There is little doubt that some may construe the equal growth since 1957 as indicating a policy failure on the part of the Chinese Government with respect to the development of the interior. It seems clear, however, that this is not the case. Rather, emphasis on the coastal areas for development purposes suggests a pragmatic approach to the full utilization of China's resources to attain more than one goal. Moreover, if China's leaders had not adopted the policy of favoring inland areas, China almost certainly would have developed as a dual economy.

ECONOMIC PLANNING IN THE PEOPLE'S REPUBLIC OF CHINA: CENTRAL-PROVINCIAL FISCAL RELATIONS

By NICHOLAS R. LARDY

I. INTRODUCTION

The degree of central control of economic planning and resource allocation is one of the least understood dimensions of post-1949 Chinese economic development. There is general agreement that during the First Five-Year Plan period (1953–57) the Chinese adopted a Soviet model of economic planning which emphasized highly centralized economic planning and management. As discussed below, this period was marked by the development of vertically organized industrial ministries, centralized determination of relatively detailed physical output targets for various sectors of the economy, and centralized control over the distribution of important raw materials and intermediate goods.

However, since the beginning of the Second Five-Year Plan (1958–62) the Chinese have made a concerted effort to modify this relatively centralized system of economic planning and management. By introducing a considerable degree of decentralization of decisionmaking the Chinese hoped to overcome the deficiencies of the highly centralized planning system that had developed by the mid-1950's. This was particularly evident during 1957 and 1958 when a series of formal decentralization directives was issued by the State Council and the Central Committee of the Chinese Communist Party. These measures are generally believed to have transferred a broad range of economic planning and resource allocation powers to the provinces at the expense of the central planning agencies and central government ministries that had played a dominant role in resource allocation during the First Five-Year Plan period.

As a result of the decentralization introduced in the late 1950's, it is now widely believed that centralized economic planning of the type that prevailed during the First Five-Year Plan no longer exists. Instead of a nationally integrated economic plan in which major spatial and sectoral allocation decisions reflect the preferences of the central political leadership, it is now widely believed that the direction of economic development is largely determined through a series of independently compiled provincial economic plans that reflect the preferences of provincial economic decisionmakers. Provincial leaders are primarily concerned with maximizing expenditure and investment in their own regions. Each area thus husbands its own resources and resists transferring significant amounts to the central government. As a result there are only minimal flows of real resources between provinces. The ensuing pattern of economic development is frequently referred to as one of regional self-sufficiency or autarky.[1]

The purpose of this paper is to examine this regionalist view of Chinese economic planning in somewhat greater detail, to trace its logical economic implications, and to attempt to determine whether or not the Chinese pattern of development is consistent with these implications. This analysis begins with a brief summary of the character of economic planning during the First Five-Year Plan period and the problems which the reforms of 1957–58 were designed to correct. This in turn, is followed by an analysis of the nature of the decentralization introduced by the reforms and an examination of the empirical evidence relating to the regionalist view of Chinese economic planning.

The major hypothesis advanced in this paper is that although the decentralization of 1957–58 introduced a number of economic reforms that have endured up to the present, these were concerned primarily with economic management rather than with economic planning and resource allocation. That is, the center, in order to improve the efficiency of economic planning and management, transferred a broad range of administrative authority to provincial governments but retained considerable resource allocation and planning powers. An analysis of central-provincial fiscal relations provides empirical evidence which suggests that the central government continued to exercise broad planning powers and that this has had a profound effect on the character of Chinese economic growth. This evidence suggests that provincial planners have not had a substantially increased role in determining the allocation of the country's economic resources and that, as a result, economic growth since the decentralization has not been characterized by a strong pattern of regional self-sufficiency. In fact, the degree of geographic redistribution of resources carried out by the Chinese central government is rather striking, particularly when compared with other large, less developed countries such as India.

II. Centralization of Economic Management, 1953–57

A variety of forces after 1949 led the Chinese to adopt the Soviet model of economic planning. Foremost among these was the full commitment of the new leadership to the rapid development of China as a major industrial and military power. They recognized that a rapid acceleration in the rate of growth could be attained only through a substantial increase in the rate of investment. The Soviet pattern of development was perceived as the only viable means for achieving the required increase in the rate of overall investment and the desired allocation of an unusually large portion of this investment for heavy industry.

[1] This general view is expressed in a number of studies. See for example, Audrey Donnithorne, *The Budget and the Plan in China: Central-Local Economic Relations* (Canberra: Australian National University Press, 1972). Alternative formulations of the regionalist view of Chinese economic planning emphasize the enhanced role of the military region commanders rather than provincial leaders in the resource allocation process. See especially Jürgen Domes, "New Course in Chinese Domestic Politics: The Anatomy of Readjustment," *Asian Survey* 13, No. 7 (July 1971), p. 641.

However, the Chinese adoption of the relatively centralized Soviet model of economic planning was also partially determined by important distributional and equality goals held by the leadership. The first of these was the desire to begin to realine the geographic distribution of industry. The leadership considered the inherited pattern of industrial development, in which industrial output capacity was concentrated in the Northeast and a few major coastal enclaves, to be the result of over a half-century of foreign domination of domestic economy. They were determined to reverse this pattern of industrial concentration not only because of strategic military considerations, but also because they believed that growth that led to increasing regional disparities in the level of development in the long run was not politically acceptable. Second, the leadership was committed to insuring a more equitable distribution of Government services. In large areas of the country in 1949 there was a virtual absence of health care facilities, educational institutions, and other important social services.

The existence of substantial interprovincial disparities in the level of economic development meant that attainment of these distributional goals would require a relatively centralized system of economic planning.[2] The size of these regional disparities is shown in table 1, which gives the gross value of industrial output by province in 1952, the eve of the First Five-Year Plan.[3] The central government required a system of redistributing resources which would assure that the provision of social services was not dependent on the local resource base. Similarly they required the means to redistribute investment resources to alter the pre-1949 pattern of economic growth which was increasing regional disparities.

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[2] I use the word province to refer to all provincial-level government administrative units, including autonomous regions and independent municipalities.

[3] Ideally one would want to measure interprovincial development differentials with data on net provincial product. However, the Chinese have never released data of this type. Although there is a great deal of data on the gross value of agricultural output by province for the 1950's, this has not yet been systematically compiled. However, a preliminary examination of this data suggests that an appropriate weighting of industrial and agricultural product would change the overall picture shown in table 1 only slightly. The ordering of provinces by level of development would change little. The overall size of the interprovincial variations would, however, be somewhat reduced since there are greater interprovincial variations in the industrial sector than in agriculture. Using per capita industrial output, rather than total output as in table 1, would also change the ordering of provinces slightly and would reduce the overall size of interprovincial variations. However, even after this adjustment is made, very substantial interregional development differentials remain.

TABLE 1.—GROSS VALUE OF INDUSTRIAL OUTPUT BY PROVINCE, 1952

[Millions of yuan]

Province	Rank	GVIO [1]
Shanghai	1	6,523
Liaoning	2	4,761
Kiangsu	3	2,584
Shantung	4	2,091
Heilungkiang	5	1,889
Tientsin	6	1,850
Kwangtung	7	1,745
Szechuan	8	1,649
Hopei	9	1,342
Chekiang	10	1,099
Kirin	11	1,090
Hupeh	12	956
Hunan	13	767
Peking	14	715
Shansi	15	643
Anhui	16	631
Kiangsi	17	575
Honan	18	478
Yünnan	19	444
Fukien	20	414
Shensi	21	381
Kwangsi	22	343
Kweichow	23	269
Inner Mongolia	24	178
Sinkiang	25	169
Kansu	26	137
Tsinghai	27	36
Ninghsia	28	[2]
Tibet	29	[2]

[1] Coverage of GVIO includes output of utilities and mining in addition to factory output. GVIO values shown are also inclusive of handicraft output.
[2] Data not available.

Source: R. M. Field, N.R. Lardy, and J.P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China, 1949–73. Foreign Economic Report No. 8, June 1975, Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, 1975.

In response to these considerations, the new Government rapidly adopted a highly centralized Soviet-style planning system. This system provided the mechanisms for redistributing resources to meet the leadership's goals of balance between inland and coastal industrial development, improved distribution of Government social services, and rapid economic growth based primarily on expansion of industrial output. The specific characteristics of this system of economic planning are well known to students of both the Soviet and Chinese economies. Most importantly it depends heavily on the development of vertical, functional lines of planning and administration as opposed to horizontal, territorial ones. The nature of this system, particularly its concentration of resource allocation decisions in the hands of the center, minimizes the role of subnational governments in economic planning. In China this was evident in production and supply planning and in investment planning.

In production planning the central government established overall goals which, in turn, were broken down into specific physical production targets for each sector and branch of the economy. These, in turn, were disaggregated by each industrial ministry into production targets for specific enterprises under direct ministerial management. Provincial governments nominally carried out a similar planning process for enterprises under local, as opposed to ministerial, control.

Thus the national economic plan was an aggregation of the plans of each ministry and the plans of all provinces. The ministerial plans were nationwide and covered all enterprises under ministerial management regardless of their location. Provincial plans were compiled on a regional basis but only included enterprises managed by local governments.

However, the role of provincial governments in the planning process was severely circumscribed for several reasons. First, most of the enterprises not directly controlled from the center were in low priority sectors such as handicrafts or were privately owned. Many of these enterprises were so small they were not even included in the planned sector. Provincial governments actually controlled only one-fourth of state managed industry.[4] Almost all large-scale modern industrial enterprises were controlled directly by the central government and were not incorporated in provincial plans. Second, many targets that were nominally to be determined by provincial governments were in fact controlled by the center.[5] Central government ministries and planning agencies frequently intervened directly to establish targets for enterprises that were nominally under local management. Furthermore, once the provincial plan had been fixed, most changes required advance approval from the center.

Material supply planning was also dominated by vertical administration. A system of "unified distribution" of important raw materials and intermediate goods was used to assure enterprises of sufficient inputs to meet specific production targets. These inputs could not be purchased on open markets but could only be obtained through this bureaucratic rationing system. Naturallv the higher priority central government enterprises received the bulk of the materials subject to unified distribution, while locally managed enterprises were generally starved for adequate supplies.

Finally investment funds were also subject to highly centralized control. During the last 3 years of the First Five-Year Plan period, 80 percent of all investment funds were channeled into projects under the direct administrative control of the center.[6] Largely as a result of this concentration of investment resources, the share of total industry managed by the center increased steadily throughout the First Five-Year Plan period.

In spite of the general success of this system of centralized planning in sharply raising the rate of capital formation and in achieving the desired spatial and sectoral allocation of investment resources, it was also the source of increasing economic inefficiency. This was due both to the inherent difficulties of central management of an economy of the size and diversity of China's and also because of increasing local dissatisfaction with the highly centralized system of economic management. In the 1950's half of China's provinces had populations of 20

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[4] Calculated on the basis of data in *First Five-Year Plan for Development of the National Economy of the People's Republic of China in 1953–1957* (Peking: Foreign Languages Press, 1956), p. 103 and State Statistical Bureau, *Ten Great Years* (Peking: Foreign Languages Press, 1960), pp. 16, 38.

[5] This problem is discussed in Chang Hsüan-san, "Centralization and Decentralization in our National Economic Plan Leadership," *Ta kung pao*, Nov. 25, 1956; Ch'en Hsueh, "Further Strengthening the Authority of Local Financing Management," *Ts'ai-cheng*, 1956, No. 1, pp. 11–13; Hsü Fei-ching, "Several Points of Opinion with Regard to the Reform of Financial Management," *Ts'ai-cheng*, 1957, No. 12, pp. 3–5; Ko Chih-ta, "Take Seriously the thorough Implementation of the Financial Policy of 'unified leadership and multi-level administration,' " *Ta kung pao*, July 12, 1956.

[6] *Hsin-hua pan-yüeh k'an*, 1956, No. 14, p. 7 and 1958, No. 5, p. 9.

million or more and many are larger than most nations of Western Europe. The problems of coordination of economic activities over such a broad area were compounded by the relatively underdeveloped state of the transportation and communications networks. Furthermore, the inherited Chinese industrial plant was marked by substantial technological diversity, even within single industries. As a result central government ministries could not manage their geographically far-flung empires with anything approaching a single set of technical coefficients.

Beginning in 1956 there was a far-reaching discussion of the appropriate degree of central control of economic planning and management. Mao's speech "On the Ten Great Relations," initiated this discussion and it was rapidly joined by Hsüeh Mu-ch'iao, the Director of the State Statistical Bureau; Ma Yin-ch'u, a well-known economist and President of Peking University; and a large number of others.[7] The ensuing discussion revealed a number of specific sources of economic inefficiency that arose primarily from the emphasis on vertical, functional lines of economic planning and management and the concomitant virtual absence of adequate horizontal, territorial coordinating mechanisms.

The absence of horizontal coordination of economic plans on a regional basis was frequently a source of inefficiency and waste. For example, it was common for both a central government ministry and a local government to construct factories in the same area to utilize local raw materials.[8] Since there was no effective means of coordinating these projects, they competed for the same raw materials. As a result, both factories operated below capacity. Similarly, central government enterprises built their own machinery repair shops and other types of auxiliary workshops even when existing locally managed enterprises could have handled the work.[9] Comparable problems arose in labor planning.[10] Local labor bureaus, nominally charged with the responsibility of drawing up local labor balances, were unable to effectively control the hiring of staff and workers largely because they were unable to incorporate the labor plans of centrally managed enterprises in their overall plans.

There was a similar lack of horizontal coordination in material supply planning.[11] Central government ministries during the First Five-Year Plan period established a network of vertically administered supply agencies. At the same time partially overlapping local supply networks with their own warehouses and commodity reserves were established by provinces, autonomous regions, and directly administered municipalities to supply the enterprises that came under their local management. As a result, commodity distribution within a single region was fragmented and unnecessarily inefficient.[12] Local govern-

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[7] Mao Tse-tung, "On the Ten Great Relations," translated in *Chairman Mao Talks to the People*, Stuart Schram, ed. (New York: Pantheon Books, 1974), pp. 61–83, see especially pp. 71–73; Hsüeh Mu-ch'iao, "Preliminary Opinions on the Current System of Plan Management," *Chi-hua ching-chi*, 1957, No. 9, pp. 20–24; Ma Yin-ch'u, *My Economic Theory, Philosophical Thoughts and Political Standpoint* (Peking: Finance Publishing House, 1958), pp. 41–42 and 130–132.

[8] Hai Ch'ü-niao, "Central Government Industry Must Unite with Local Industry," *Jen-min jih-pao* Nov. 16, 1957; Ma Yin-ch'u, *My Economic Theory*, p. 41.

[9] Ch'en Ta-lun, "The Reform of our Country's Industrial Management System," *Ching-chi yen-chiu*, 1958, No. 3, p. 34; Ma Yin-ch'u, *My Economic Theory*, p. 41.

[10] Christopher Howe, *Employment and Economic Growth in Urban China 1949–1957* (Cambridge: At the University Press, 1971), pp. 115, 133.

[11] She I-san, "A Discussion of the Reform of the Commodity Distribution System," *Chi-hua ching-chi*, 1958, No. 10, pp. 34–36.

[12] Ch'en Ta-lun, "The Reform of our Country's Industrial Management System," p. 34.

ments were unable to coordinate material supplies since a large part of the system was administered through direct vertical lines from Peking.

III. The Character of the Chinese Reforms

Unlike economic reform discussions in the Soviet Union, Eastern Europe and Yugoslavia, in China there was no serious public consideration of decentralization through the market. There was no school of economists which advocated that efficiency of economic planning and management could be improved through a reform of the price system and greater reliance on the use of markets as a means of allocating resources among alternative uses. Instead the Chinese discussion focused almost exclusively on the appropriate degree of administrative decentralization or what Professor Wiles refers to as "decentralized command." [13] That is, the central issue of this discussion was to determine which planning and administrative functions should be retained by the center and which should be devolved to lower levels of government administration.

This focus on decentralized command was also evident in the decentralization directives themselves. While decentralization through the market inevitably involves the transfer of resource allocation and other decisionmaking powers to productive units, that is, enterprises themselves, the decentralization directives announced in late 1957 and in 1958 were concerned almost exclusively with the transfer of administrative authority to the provincial governments. These subnational governments received enhanced powers in the areas of industrial, commercial, and financial management, taxation, price control, grain management, materials distribution management, and in economic planning.[14]

The specific provisions of these reforms are well known. In industry and commerce, most enterprises which had previously been managed by central government ministries from Peking were transferred to joint administration by the center and the locality. Provincial governments were also given increased authority over enterprises that remained under exclusive central government control. Most importantly, the decentralization gave provinces the power to formulate regional economic plans which incorporated all enterprises within the province. Furthermore the number of commodities subject to unified distribution by the centrally administered supply system was reduced, partly by transferring the allocational responsibility for some commodities to provincial governments. Provincial planners were now responsible for allocating raw materials to the remaining central government enterprises.

Provincial governments also were given expanded financial powers. Most importantly, after the decentralization 20 percent of the profits of enterprises transferred to joint central-local rule were to be retained by local governments for financing local expenditures. Furthermore, provincial governments were to receive increased authority in arranging their own expenditures. The decentralization also expanded

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[13] P.J.D. Wiles, *The Political Economy of Communism*, (Cambridge: Harvard University Press, 1964), pp. 140–146.

[14] These decentralization measures were published in the official compendium of laws, *Chung-hua jen-min kung-ho-kuo fa-kuei hui-pien*, vols. 6–8. The following two paragraphs are based on these decrees.

provincial administrative powers in tax management and price control. It is this seemingly broad transfer of economic power to provincial governments that has given rise to the regionalist interpretation of Chinese economic planning.

IV. Implications of the Regionalist View

The fundamental implication of the regionalist view of economic planning is increasing provincial inequality. As will be documented below, during the First Five-Year Plan period, the central government through the centralized economic planning and budgetary process consistently transferred income and wealth from the well developed provinces to backward areas. This powerful pattern of central government redistribution is evident in both the structure of central-provincial revenue sharing rates and in the regional distribution of expenditures.

A significant alteration of this pattern of redistribution would have important implications for the pattern of Chinese social and industrial development. A diminution of the power of the center to extract proportionately more resources from more developed areas and transfer them to less developed regions would result in a decline in the level of services provided in the latter areas and a tendency for industrial growth to become more concentrated in areas of greatest existing industrial capacity. Proponents of the regionalist view of Chinese economic planning explicitly state or implicitly assume that self-sufficiency will inevitably lead to increasing inequalities between different regions. "Reliance on local resources, whether material or managerial, for investment to expand output is inevitably a system of 'to him that hath, shall be given'." [15]

V. The Empirical Evidence

A. The First Five-Year Plan Period

As mentioned above, the highly centralized system of economic management adopted during the First Five-Year Plan period was used to carry out a substantial redistribution of resources, for both investment and current noninvestment expenditures, to meet the government's distributional and equity goals. The broad outlines of this resource redistribution were disclosed in the national First Five-Year Plan. Somewhat more detailed information was contained in the annual national and provincial economic plans.[16] These plans, which were drawn up primarily in physical terms, specified not only the distribution of investment resources among different sectors of the economy, but also the geographic location of many major projects in industry, transportation, trade, public utilities, et cetera. In addition they also specified targets for increases in school enrollments and the development of cultural and other social programs. From these physical plans it is, of course, not possible to measure the degree of

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[15] Audrey Donnithorne. "China's Cellular Economy: Some Trends since the Cultural Revolution," *The China Quarterly*, No. 52 (October/December 1972), p. 613. This view is also supported by François Durand, *Le Financement du Budget en Chine Populaire* (Paris: Editions Sirey. 1965), p. 223.

[16] A comprehensive listing of provincial economic plans and a wealth of other sources of provincial economic data is contained in John Philip Emerson, *The Provinces of the People's Republic of China: An Economic and Political Bibliography*, (forthcoming).

resource distribution. There is an insurmountable problem of aggregation because major projects are typically specified by their level of planned output rather than their expected cost. Furthermore, the geographic sources of the physical inputs necessary for their construction are not specified.

However, material transfers inherent in these plans are all accompanied by monetary payments. The central and provincial budgets provide the funds to finance the industrial development projects included in the central and provincial government plans respectively. In addition the central government budget includes defense expenditures and outlays for the central government administrative apparatus and a limited number of social, health, and educational programs administered directly from Peking. Provincial budgets finance expenditures for local government administration and most social programs in addition to the provincial economic development program. Because the national budget is a unified budget that includes the revenues and expenditures of the central government as well as the provinces, it alone can not be used to measure resource flows between different regions of the country. When the national budget is used in conjunction with provincial budgets, however, one can begin to measure the redistribution of real resources which is inherent in the physical planning process.

The central characteristic of the planning and budgetary process at the provincial level is the absence of a functional link between the size of each province's revenues and its expenditures. The first step in this process is the center's determination of the maximum level of expenditures permitted in each province. This determination is based on the outlays required to finance the centrally approved provincial economic development plan and to finance the approved levels of spending for local government administration and for social services. Central fiscal control of the latter categories of programs was particularly important since they were less amenable to direct physical management. After estimating the total revenues available to each province, the center calculates a revenue remission rate for every province. These are set so that each province will be left with just enough revenue to finance the initially determined level of expenditure. Because of the center's commitment to reducing the degree of interprovincial inequality, backward provinces typically have low remission rates or may even retain all of their revenues and receive additional subsidies, while more developed provinces are allowed to spend only a relatively small portion of their revenues, the rest being remitted to the central government.

This pattern of highly differentiated revenue sharing rates is shown in table 2 which gives the rates for provinces listed by level of industrial development. More developed provinces such as Szechuan, Kiangsu, Chekiang, Shantung, and Kwangtung are required to remit a very high proportion of the revenues they collect. In 1956, for example, these five provinces each remitted about 60 percent of their revenues. Less developed provinces such as Tsinghai, Tibet, Kansu, Sinkiang, and Inner Mongolia usually retain all of their revenues and receive additional subsidies from the central government to finance their own expenditures. Through this redistributive mechanism the central government is able to assure that the level of local social services and the magnitude of investment in local industry and agriculture is not dependent on the volume of resources available within each province.

TABLE 2.—CENTRAL-PROVINCIAL REVENUE SHARING RATES, 1956 AND 1957 [1]

[In percent]

	1956	1957
Szechuan [2]	−62.5	[3] −50.8
Kiangsu [4]	−63.4	−49.2
Shantung [5]	−59.2	−51.6
Heilungkiang [6]	−32.7	[3] −48.3
Kwangtung [7]	−59.6	−56.3
Hupeh [8]	−35.5	[3] −41.1
Hopeh [9] (excluding Tientsin)	−5.1	−21.7
Chekiang [10]	−61.1	−55.0
Shansi [11]	−11.9	−10.8
Hunan [12]	−41.0	−39.4
Honan [13]	−40.2	−35.1
Anhui [14]	−10.5	−17.6
Shensi [15]	−23.5	[3] −23.4
Kiangsi [16]	−34.0	−29.9
Yunnan [17]	−18.7	[3] 0
Kwangsi [18]	−18.5	+8.6
Inner Mongolia [19]	0	−11.5
Kweichow [20]	−30.3	−22.7
Kansu [21]	[22] +11.0	
Sinkiang [23]	+5.2	+7.2
Tsinghai [24]	+61.5	+62.8
Tibet [25]	[26] +70–80	

[1] Provinces are listed in descending order of gross value of 1957 industrial output (including handicrafts). Negative numbers show provincial net remittances to the central government as a percent of total revenues collected by the Province. Positive numbers show net subsidies from the center as a percent of total provincial expenditure. All percentages are calculated on the basis of final accounts except as noted. Financial reports are also available for Liaoning, Kirin, Peking, Tientsin, and Shanghai for this period. However since these areas shared in fewer revenue sources with the central government, their remission rates are not comparable with those given above.
[2] d-Ssu-ch'uan jih-pao, Aug. 24, 1957.
[3] 1957 final accounts are not available for these Provinces. Number show is calculated on the basis of 1957 budgetary figures.
[4] Hsin hua jih-pao, May 17, 1957, Oct. 16, 1958.
[5] Ta-chung jih-pao, Aug. 17, 1975, Nov. 3, 1958.
[6] Hei-lung-kiang jih-pao, Sept. 25, 1957.
[7] Nan-fang jih-pao, July 27, 1957.
[8] Ch'ang-chiang jih-pao, Aug. 27, 1957.
[9] Ho-pei jih-pao, Aug. 24, 1957, Apr. 27, 1958.
[10] Che-chiang jih-pao, Jan. 25, 1958, Nov. 9, 1958.
[11] Shan-hsi jih-pao, Aug. 27, 1957, Dec. 8, 1958.
[12] Hsin Hu-nan pao, Dec. 22, 1957, July 4, 1958.
[13] Ho-nan jih-pao, Aug. 25, 1957, Jan. 1, 1959.
[14] An-hui jih-pao, Sept. 24, 1957, Nov. 10, 1958.
[15] Shan-hsi jih-pao, Aug. 30, 1957.
[16] Chiang-hsi jih-pao, Apr. 1, 1957, July 5, 1958.
[17] Yün-nan jih-pao, Aug. 17, 1957.
[18] Kuang-hsi jih-pao, Aug. 25, 1957, Mar. 15, 1958.
[19] Nei-meng-ku jih-pao, Apr. 27, 1957, June 28, 1958.
[20] Kuei-chou jih-pao Aug. 15, 1957, Sept. 25, 1958.
[21] Kanus Provincial Finance Department, "Ten Great Years of Finance in Kansu, in Chung-hua jen-min kung-ho kuo shih-nien ts'ai-cheng ti wei-ta ch'eng-chiu, Peking, 1959, p.199.
[22] Value for Kansu is for the period 1953–57. Annual breakdown not available.
[23] Hsin-chiang jih-pao, Apr. 18, 1957, Feb. 1, 1959.
[24] Ch,ing-hai jih-pao, Aug. 14, 1957, July 6, 1958.
[25] Ko Chih-ta, "The Nature of the State Budget in Our Country and Its Function in the Transition Peroid," Ching-chi yen-chiu, No. 3, 1956, pp. 76–77.
[26] Value for Tibet is for the period 1952–55. Annual breakdown and values for 1956 and 1957 are not available.

The redistributive powers of the central government are not fully reflected by the data in table 2. In addition to the redistribution carried out through local plans and budgets, the central government implements a far-reaching redistributive program through investment projects undertaken directly by its industrial ministries. These projects are managed directly from Peking and are not reflected in provincial plans or in provincial expenditures. They are financed by a combination of remittances from more developed provinces and the revenues collected directly by the central government. Toward the end of the First Five-Year Plan period about 60 percent of total government revenues were collected through provincial budgets.[17] The remaining 40 percent was collected directly by the central government, primarily from the profits of enterprises under direct central management. Most of these directly collected revenues in fact came from the more developed areas where central government enterprises are concentrated. Since these revenues are not reflected in central-provincial revenue sharing rates, table 2 actually understates the degree to which Peking was able to redistribute resources from rich to poor provinces.

This is brought out most clearly by examining the budgetary role of Shanghai, the most-developed provincial level administrative unit. During the First Five-Year Plan period, the sum of revenues collected directly by the central government in Shanghai and those transferred to Peking by municipal remissions, financed almost one-fifth of central government expenditures. As shown in table 3, a very small proportion of these revenues, about 6 percent, was returned to Shanghai in the form of direct central government investment. By and large, the municipality's revenues were used by Peking to finance central government investment programs in other areas of the country rather than being reinvested in Shanghai to stimulate local economic growth.

TABLE 3.—*Shanghai's budgetary role during the first 5-year plan period*

[Absolute numbers in billions of yuan]

1. Revenues from Shanghai to the central government [1]	17.79
2. Total central government expenditures	101.13
3. 1/2 (percent)	17.6
4. Direct central government investment in Shanghai [2]	1.0
5. 4/1 (percent)	5.6

[1] Includes revenues collected directly by the central government and remissions through the municipal budget.

[2] Excludes municipal investment financed through revenues retained by the municipality.

SOURCES

Line 1—P'an Hsüeh-min. "The Development of Industry in Shanghai," *Ti-li chih-shih*, No. 7, 1959, p. 304. *Chieh-fang jih-pao*, Nov. 7, 1958.

Line 2—1953–55: Ko Chih-ta, *China's Budget during the Transition Period*, Peking. Finance Publishing House, 1957, p. 37. 1956: Li Hsien-nien, "Report on the state's 1956 final accounts and the 1957 draft state budget," *Hsin-hua pan-yüeh k'an*, No. 14, 1957, p. 23. 1957: Li Hsien-nien, "Report on conditions of implementation of the 1957 state budget and the 1958 draft state budget," *Hsin-hua pan-yüeh k'an*, No. 5, 1958, p. 9.

Line 4—*Chieh fang-jih-pao* Aug. 11, 1956, Aug. 28, 1957, Nov. 7, 1958, June 7, 1959.

B. 1958–60

As suggested in section IV, the essential argument of the regionalist view of Chinese economic planning is that the far-reaching central government control over the resource allocation process reflected in tables 2 and 3 was fundamentally altered by the decentralization in-

[17] In 1955 and 1956 provincial governments collected 54 and 60 percent, respectively, of total national budgetary revenues. Li Hsilen-nien, "Report on the State's 1954 Final Accounts and the State's 1955 Budget," *Hsin-hua yüeh pao*, 1955, No. 8, p. 28; Li Hsien-nien, "Report on the State's 1955 Final Account and the State's 1956 Budget," *Hsin-hua pan-yüeh k'an*, 1956, No. 14, p. 8.

troduced in 1958. If provinces after 1957, did gain greater control over the allocation of resources they collected, the decentralization would have had a markedly inegalitarian result. More developed provinces with higher remission rates in the pre-decentralization period would have vastly increased resources at their disposal which they would allocate for local expenditure programs rather than remitting to the center. Because remittances from wealthier provinces would be reduced, and because the share of total government revenues collected directly by Peking fell from about 40 to 20 percent, the center would no longer have the resources to either subsidize the local expenditures of poorer provinces or to carry out a redistributive investment program.[18] As a result, the most basic implication of the regionalist view of economic planning is that the decreased authority of the central government over resource allocation would be reflected in a substantial change in the overall geographic pattern of resource redistribution and eventually in the pattern of provincial industrial growth.

However, direct tests of the pattern of provincial expenditures in the 2 years following the decentralization fail to support this hypothesis.[19] For example, more developed provinces on the average were not able to increase their per capita expenditures for social programs more than less developed provinces. As a result, the ability of these poorer provinces to provide education, public health, and welfare services to their populations did not decline as compared with more developed provinces. Similarly, there was no shift in aggregate investment expenditures in favor of more developed regions. That is, richer provinces on the average were not able to increase their shares of total national investment at the expense of less developed regions. These tests thus suggest that provincial governments were not able to increase their control over the resources generated within their own boundaries and that the central government continued to be able to carry out a significant redistribution of resources.

An examination of central-provincial revenue sharing rates after the decentralization helps to explain the apparent absence of any significant shift of expenditures in favor of more developed provinces. The revenue sharing rates for 1959 are shown in table 4. The structure of these rates suggests that despite the economic powers transferred to the provinces by the decentralization, Peking continued to exercise highly centralized budgetary controls over provincial expenditures. Just as in the pre-decentralization period, the central government strictly controlled each province's expenditures, for both investment and non-investment programs.

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[18] The central government collected directly 20 percent of total national revenues in 1958 (actual) and in 1959 (planned). Ko Ling, "Leap Forward, Leap Forward Again—Study Vice-Premier Li Hsien-nien's Report on the State's 1958 Final Accounts and the 1959 Draft State Budget," *Ts'ai-cheng*, 1959, No. 9, p. 20.

[19] A more complete explanation of these expenditure tests and the data on which they are based is set forth in Nicholas R. Lardy, "Centralization and Decentralization in China's Fiscal Management," *The China Quarterly*, No. 61 (March 1975), pp. 33–44.

TABLE 4.—*Central provincial revenue sharing rates, 1959*

Shanghai[1]	−80.2	Honan[15]	[8]−22.0
Liaoning[2]	[3]−63.9	Anhui[16]	+30.7
Szechuan[4]	−33.2	Shensi[2]	[17]+
Kiangsu[5]	−45.6	Kiangsi[2]	[17]+
Tientsin[6]	−69.2	Yünnan[18]	+18.0
Shantung[7]	[8]−44.8	Fukien[2]	[17]+
Heilungkiang[2]	[2]−50.5	Inner Mongolia[2]	[17]+
Kwanktung[9]	−43.3	Kansu[2]	[17]+
Hopei[10] (excluding Tientsin)	−28.8	Kwangsi[2]	[17]+
Hupeh[2]	[3]−4.2	Sinkiang[19]	+25.9
Kirin[11]	−27.4	Kweichow[20]	+18.2
Peking[12]	−51.2	Tsinghai[21]	[8]+56.7
Chekiang[2]	[3]−31.0	Ninghsia[2]	[17]+
Shansi[13]	+7.9	Tibet[22]	+83.5
Hunan[14]	−19.6		

Provinces are listed in descending order of gross value of 1957 industrial output (including handicrafts). Negative numbers show provincial net remittances to the center as a percent of total revenues collected in the province. Positive numbers show net subsidies from the center as a percent of total provincial expenditures. All percentages are calculated on the basis of final accounts except as noted.

[1] *Chieh-fang jih-pao,* May 18, 1960.

[2] Ministry of Finance, "Notice on the total amount proportionate remission rates of the local budgets to the central government budget for the first quarter of 1959," (25 December 1958), *Chung-yang ts'ai-cheng fa-kuei hui-pien* (Compendium of central government fiscal laws and regulations) 1958, vol. 2, p. 61. (Peking, 1959.)

[3] Planned revenue sharing rate for the 1st quarter of the 1959 fiscal year. Annual data not available. For 8 provinces both the planned 1st quarter rate and the actual annual rate are available. For these 8 the average absolute difference between planned and actual rates is less than 6 percentage points. Thus the planned 1st quarter rate can be considered a close approximation of the annual rate.

[4] *Ssu-ch'uan jih-pao,* May 27, 1960.

[5] *Hsin-hua jih-pao,* Dec. 31, 1959.

[6] *T'ien-chin jih-pao,* May 27, 1960.

[7] *Ta-chung jih-pao,* May 24, 1959.

[8] Planned revenue sharing rate for the entire year.

[9] *Nan-fang jih-pao,* Oct. 13, 1959.

[10] *Ho-pei jih-pao,* Feb. 22, 1960.

[11] *Chi-lin jih-pao,* May 27, 1960.

[12] *Pei-ching jih-pao,* July 1, 1960.

[13] *Shan-hsi jih-pao,* May 25, 1960.

[14] *Hsin Hu-nan pao,* Dec. 23, 1960.

[15] *Ho-nan jih-pao,* Jan. 1, 1959.

[16] *An-hui jih-pao,* May 13, 1960.

[17] Planned expenditures in these provinces were greater than anticipated revenues, resulting in a subsidy from the central government. However, the size of this subsidy in relation to expenditures is not known.

[18] *Yün-nan jih-pao,* June 9, 1960.

[19] *Hsin-chiang jih-pao,* May 30, 1960.

[20] *Kuei-chou jih-pao,* Dec. 13, 1960.

[21] *Ch'ing-hai jih-pao,* May 21, 1959.

[22] *Hsi-tsang jih-pao,* May 3, 1960.

Wealthier provinces with revenues in excess of these approved expenditures were required to remit the balance to the central government. In 1959, 15 provincial level administrative units were in this position while the other 14 had revenues less than their approved expenditures and received subsidies from Peking. The resulting central-provincial revenue sharing rates reveal the systematic redistributive influence of the center's fiscal program. The most developed provinces, shown at the top of table 4, had the highest remission rates. Indeed, all of the provinces which were at or above the median level of industrial output, with the exception of Shansi, were required to remit part of their revenues to Peking. These remission rates ranged from 4 to 83 percent. All of the provinces which were below the median level of development, with the exception of Honan, retained all of their revenues and in addition received subsidies from the central government. These subsidies ranged from 8 to 80 percent of total provincial expenditures. Although the size of these subsidies is not known for seven provinces, the trend is unmistakable—higher subsidies for the poorer of the less developed provinces.

These data, of course, do not support the regionalist view of Chinese economic planning. They show that the center continued to extract proportionately more resources from precisely those provinces predicted to have gained the most as a result of the decentralization. Compared with the First Five-Year Plan period, central government subsidies to backward areas have increased and more provinces have moved into a subsidy position. Thus this data supports the same conclusion as the expenditure tests summarized above—that the central government continued to exercise relatively centralized control of economic planning. This control was used to redistribute a substantial volume of real resources on an interprovincial basis. In short there is little evidence of the development of a pattern of provincial self-sufficiency or autarky.

C. The Post-1960 Period

The evidence presented above strongly supports the view that the redistributive nature of Chinese economic planning was not significantly altered in the immediate postdecentralization years. However, this evidence does not help to clarify the evolving balance of resource allocation powers between the center and the provinces since 1960. Clearly a number of developments since 1960 could be interpreted as a reduction in the redistributive powers of the central government. Most important are the charges of regionalism leveled against some provincial leaders during the Cultural Revolution and continuing Chinese rhetoric in support of an economic development policy based on local self-sufficiency. For example, Chiang Hua the First Party Secretary in Chekiang is reported to have refused to transfer certain commodities to Shanghai saying "Chekiang is not a colony of Shanghai." Requests for the transfer of foodgrains to other provinces were also reported to have been refused on the grounds that feeding of livestock within Chekiang took a higher priority.[20] The campaign for local self-sufficiency, particularly the verbal emphasis on the development of local industry, also would seem to suggest an attenuation of the redistributive role of the center in recent years.[21]

These developments naturally lead one to ask to what extent the degree of central control of economic planning has been altered in the 1960's and 1970's Does Peking continue to exercise wide-ranging powers over resource allocation? If so, does it continue to redistribute resources from more to less developed provinces? Has the degree of redistribution been as significant as that of the 1950's?

These are difficult questions to answer with the limited information available since 1960.[22] Despite the relative lack of data and qualitative information concerning the evolution of central-provincial fiscal relations and the planning process, I believe it is possible to give a preliminary answer to these questions. There are two major types of

[20] Chekiang Provincial Radio, Jan. 13, 1969, cited in Audrey Donnithorne, "China's Cellular Economy," pp. 616–617.

[21] This view has been advanced by several writers. See for example, Harry Harding, "China: The Fragmentation of Power," *Asian Survey* 12, No. 1 (January 1972), p. 5.

[22] Since 1960 the Chinese have released no national or provincial data on budgetary revenues or expenditures. In addition the Compendium of Fiscal Laws and Regulations, which was published regularly during the 1950's and provided very detailed information on the fiscal system and budgetary process, has not been available since 1959.

evidence bearing on the evolution of the redistributive powers of the central government since 1960. The first is a comparison of the pattern of provincial industrial growth during the First Five-Year Plan period with the years since 1965. In addition, there is also recent evidence on revenue sharing rates between the center and the provinces.

1. THE PATTERN OF PROVINCIAL INDUSTRIAL GROWTH

1952–57

The First Five-Year Plan period was marked by substantial inter-regional variations in rates of industrial growth, and in general less developed provinces were the fastest growing.[23] Ranking 28 provinces by the level of their industrial output in 1952, of the 14 provinces below the median level of development, over two-thirds experienced rates of industrial growth that were above the median rate. This pattern is reflected in table 5. On the whole this group of poor but relatively rapidly growing provinces, shown in the first quadrant of table 5, benefited from favorable fiscal treatment from the central government. This made available substantially more inputs for local growth than would have been the case in the absence of central government redistribution.

TABLE 5.—THE PATTERN OF PROVINCIAL INDUSTRIAL GROWTH, 1952-57

	Below average level of development (1952 GVIO)	Above average level of development (1952 GVIO)
Above average rate of industrial growth 1952-57.	Ninghsia, Kansu, Inner Mongolia, Honan, Tsinghai, Fukien, Sinkiang, Shensi, Yunnan, Shansi.	Szechuan, Hupeh, Peking, Liaoning.
Below average rate of industrial growth (1952-57).	Anhui, Kwangsi, Kweichow, Kiangsi...	Tientsin, Kirin, Kwangtung, Hopeh, Heilungkiang, Chekiang, Shanghai, Shantung, Kiangsu, Hunan.

Source: R. M. Field, N. R. Lardy, J. P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China, 1949-73." Foreign Economic Report No. 8, June 1975, Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, 1975.

On the other hand, over two-thirds of the provinces which were above the median level of development in 1952 experienced rates of industrial growth below the median. This group of slow growing important industrial centers, which includes Shanghai, Kiangsu, Shantung, Chekiang, and Kwangtung, were major sources of government revenues during the First Five-Year Plan period. However, as we have seen, they were required to remit the vast majority of these resources to the coffers of the central government. Furthermore, the return flow of resources to these areas in the form of direct central government investment in most cases was relatively small.

The statistical significance of the pattern of industrial growth shown in table 5 can be tested using a simple two-way contingency test. The test supports the view that there was a significant inverse correlation between the initial level of industrial output and the subsequent rate of industrial growth.[24]

[23] Average annual rates of provincial industrial growth during 1952–57 ranged from 33 to 12 percent.

[24] At the 10-percent level of significance the calculated X^2 allows us to reject the null hypothesis that there is no relationship between the initial level of industrial development and the subsequent rate of industrial growth.

TABLE 6.—THE PATTERN OF PROVINCIAL INDUSTRIAL GROWTH, 1965–71

	Below average level of development (1957 GVIO)	Above average level of development (1952 GVIO)
Above average rate of industrial growth, 1965–71.	Tsinghai, Kansu, Shensi, Honan, Kwangsi, Hunan, Sinkiang, Ninghsia, Anhui.	Peking, Shantung, Kiangsu, Hopeh, Hupeh.
Below average rate of industrial growth.	Kiangsi, Yunnan, Fukien, Kweichow, Inner Mongolia.	Tientsin, Szechuan, Shanghai, Chekiang, Liaoning, Kwangtung, Heilungkiang, Shansi, Kirin.

Source: R. M. Field, N. R. Lardy, J. P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China, 1949–73." Foreign Economic Report No. 8, June 1975, Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, 1975.

1965–71

Was this pattern of industrial development substantially altered by the decentralization? Proponents of the regionalist view have hypothesized that the decentralization transferred resource allocation powers to provincial governments, and that this transfer would inevitably lead to relatively faster growth in more developed areas. At the same time, poor provinces that previously had depended heavily on central government subsidies in their rates of industrial growth. Thus, after the decentralization the regionalist view of Chinese economic planning predicts a substantially strengthened (weakened) positive (negative) correlation between the level of development and rate of industrial growth.

This prediction can be tested by comparing the pattern of provincial industrial growth in the post-decentralization years with that during the First Five-Year Plan period. The pattern of provincial industrial growth during 1965–1971 is shown in table 6.[25] In broad terms the pattern did not differ from that of 1952–57. In general, there continued to be substantial inter-regional variations in rates of industrial growth and an inverse relation between level of development and rate of growth.[26] Again, of the provinces where industrial output was initially below the median level, about two-thirds had above median growth rates. This group included many provinces that had also been less developed but rapidly growing during 1952–57—Ninghsia, Tsinghai, Kansu, Shensi, Honan, and Sinkiang. Of the more developed provinces, about two-thirds experienced rates of growth that were below the median level. Most of this group was also slow growing during 1952–1957.

Of course, the pattern of provincial industrial growth in 1965–71 is not precisely the same as that observed during the First Five-Year Plan period. For example, among the provinces with above median levels of industrial output, Kiangsu and Shantung have moved from the low to the high growth category, while Liaoning has moved from the high to low growth rate category. However, there has been no

[25] I have used provincial industrial growth rates for the period 1965–71 to maximize the sample size and facilitate comparison with the pattern of growth in 1952–57. Reports of provincial industrial growth in the last few years frequently use 1965, the year before the Cultural Revolution, as the base year for comparison. Furthermore I have used provincial industrial output in 1957 as the measure of initial level of development because the 1965 values are available for fewer than 20 provinces. However this may not introduce any bias. Only 1 pair of provinces crossed the median level of development during a period of similar length, 1952–57.

[26] During the 1965–71 period the average annual rates of provincial industrial growth ranged from about 23 to 7 percent.

significant shift of provinces toward the configuration suggested by the regionalist view of Chinese economic planning—the combination of rapid growth with high levels of output and slow growth with low levels of output.

Implications of the growth rate pattern

What are the implications of the pattern of provincial industrial growth in the 1950's and 1960's for the redistributive powers of the central government? There are a number of reasons for believing that in the absence of central government redistribution there would tend to be a positive correlation between level of development and rate of growth. If each area had the same incremental capital-output ratio, an equal rate of return on existing capacity, and equal access to labor and other factors of production, we would expect provinces to grow at roughly the same rate. However, there is every reason to believe that these conditions did not generally apply and that more developed provinces enjoyed significant advantages. Incremental capital-output ratios in more developed regions were lower, on the average, than in less developed areas where the existing industrial infrastructure was less adequate. Furthermore, existing centers of industry enjoyed substantial comparative advantages from their disproportionate concentration of skilled manpower and their greater access to modern technology. They also enjoyed economies of scale and some locational advantages. Due to peculiarities of Chinese industrial product pricing policies it is also likely that the rate of return on existing capacity in more developed provinces was substantially higher than that in less developed areas. Jeffrey Williamson's study of the relationship between the level of development and rate of growth also supports the view that richer provinces would be relatively faster growing in the absence of central government redistribution.[27] Using both time series and cross section data for a number of countries, he found that the early stages of national economic growth tend to be associated with increasing regional disparities in the level of development.

In short, if provincial governments had been able to retain and reinvest all of the revenues generated in their own areas, there would tend to be a positive correlation between initial level of development and the rate of growth. However, as shown in table 5 during the First Five-Year Plan period such a relationship did not exist and, in fact, more developed provinces on the whole experienced relatively slow rates of industrial growth. Table 6 shows that this general pattern continued during the period 1965–71. The absence of a substantial change in the pattern of provincial industrial performance between these two periods suggests that the matrix of economic forces influencing relative provincial performance was not substantially altered by the decentralization. This tends to support the view that the redistributive nature of central government economic planning has not changed significantly since 1960.

This indirect evidence from the pattern of provincial industrial growth is only suggestive. It is however supported by scattered direct

[27] Jeffrey G. Williamson, "Regional Inequality and the Process of National Development: A Description of the Pattern," *Economic Development and Cultural Change,* 13, No. 4, part 2 (July 1965).

evidence of the continuing redistributive role played by the central government. This evidence comes both from recent interviews of Western visitors to the People's Republic of China and fragmentary data released by the Chinese.

2. CENTRAL-PROVINCIAL REVENUE SHARING SINCE 1960

Provincial governments continue to play a significant role in revenue collection after 1960. In 1972 they collected 80 percent of all government revenues—the same share as in 1958 and 1959.[28] Given this continued preeminence of provincial, as opposed to central, revenue collection, the degree of central government control of the economic planning process can be measured by the degree of differentiation in central-provincial revenue sharing rates. That is, the central government will not be able to redistribute a significant volume of resources from developed to backward areas unless it succeeds in extracting proportionately greater resources from the former.

Incomplete evidence suggests that the pattern of central-provincial revenue sharing established in the 1950's (shown in tables 2 and 4) continues in the 1960's and 1970's. More developed provinces still give up a disproportionately large share of the revenues they collect while poorer provinces retain all of their revenues and also receive additional subsidies from the center. Although comprehensive information on these rates is not available, specific rates for several provinces were obtained by Professor Robinson and others on a recent visit to the People's Republic. These rates are shown in table 7.

TABLE 7.—CENTRAL PROVINCIAL REVENUE SHARING RATES, POST-1960[1]

Province	Period	Revenue sharing rate (percent)
Shanghai[2]	1972	−90
Liaoning[2]	1972	−82
Kiangsu[2]	1972	−70
Inner Mongolia[2]	1972	(3)
Kwangsi[2]	1972	(3)
Sinkiang[2]	1972	(3)
Ninghsia[2]	1972	(3)
Tibet[4]	1960–73	>+50

[1] Provinces are listed in descending order of gross value of 1972 industrial output (including handicrafts). Negative numbers, with the exception of Shanghai, show provincial net remittances to the center as a percent of total revenues collected by the province. For Shanghai the remission rate is inclusive of central government investment. (See footnote 69 for discussion of Shanghai.)

[2] Joan Robinson, "Economic Management in China" (London: Anglo-Chinese Educational Institute, 1975), p. 30; Roland Berger, "Financial Aspects of Chinese Planning," Bulletin of Concerned Asian Scholars 6, No. 2 (April–August 1974), p. 18.

[3] Indicates that the province retained 500 percent of its revenues and in addition received a net subsidy from the central government but that the size of this subsidy in relation to expenditures is not known.

[4] New China News Agency, Peking, Sept. 22, 1974, in "Survey of People's Republic of China Press," Oct. 7–55, 1974, p. 27. This source states that over ½ of all expenditures in Tibet during this period were financed from central government subsidies.

Shanghai, the most important industrial center, remits 90 percent of its revenues.[29] Liaoning and Kiangsu, the second and third most important industrial provinces in the early 1970's, also remit the vast

[28] Joan Robinson, *Economic Management in China* (London: Anglo-Chinese Educational Institute, 1975), p. 29.

[29] This figure, unlike the rate for Shanghai in table 4, is inclusive of central government investment. This means that the actual outflow of revenues from the municipality is greater than 90 percent but that this is partially offset by direct central government investment in Shanghai. The comparable revenue sharing rate for Shanghai in 1959 inclusive of central government direct investment is −76 percent.

majority of their revenues. Their remission rates, 82 and 70 percent respectively, are substantially above those of 1959. The five autonomous regions, still among the least-developed areas of the country, retain all of their revenues and receive additional direct subsidies from the central government. For Tibet, independent sources indicate that this subsidy has been equivalent to more than 50 percent of the region's total expenditures since 1960. In short, the pattern of central-provincial revenue sharing suggests that the central government continues to utilize its planning powers to redistribute considerable resources from rich to poor areas. A comparison of table 7 with tables 2 and 4 suggests that the general magnitude of this redistribution is as great in the early 1970's as it was in the 1950's.

The continued pattern of central government control of economic planning is also supported by data on the ratio between investment and total budgetary revenues released by the Chinese. Accumulated capital (chi-lei tzu-chin) is the term used for total budgetary revenues originating in a region, irrespective of whether they are collected by the center or the locality. The ratio of investment to accumulated capital for a province is thus a measure of the extent to which the area is successful in channeling its revenues into capital investment projects that will contribute to its further economic growth. Nationally this is simply the ratio of capital investment in all sectors to total national budgetary revenues. During the First Five-Year Plan period it ranged from a low of 29 percent in 1954 to a high of 48 percent in 1956.[30] In Shanghai, however, most revenues were remitted to the center and did not flow back as central investment. As a result, the ratio of investment to total budgetary revenues for the First Five-Year Plan period, as shown in table 8, was only 7.25 percent.

Shanghai has recently released comparable data for the entire twenty-five year period 1949–1973. The ratio during this period, shown in table 8, was 6.7 percent. These ratios support two points. First, the large outflows of revenues from Shanghai is not limited to 1959 or 1972, the years shown in tables 4 and 7, but has been a consistent pattern since 1949. Secondly, the similar size of the ratios for 1949–73 and 1953–57 suggests that since the decentralization of the late 1950's Shanghai has not been able to increase its control over the allocation of the revenues it generates.

TABLE 8.—TOTAL REVENUE AND INVESTMENT IN SHANGHAI

[Absolute numbers in millions of yuan]

	1953–57	1949–73
1. Total investment [1]	1,371	[2]
2. Total budgetary revenues [3]	18,900	[2]
3. ½ (percent) [4]	7.25	6.7

[1] Chieh-fang jih-pao, June 7, 1959.
[2] Not available.
[3] P'an Hsüeh-min, "The Development of Industry in Shanghai," Ti-li chih-shih, No. 7, 1959, p. 304.
[4] 1953–57 calculated. 1949–73 New China News Agency, Sept. 28, 1974, in Foreign Broadcast Information Service, Daily Report PRC, Sept. 30, 1974, p. G3.

[30] Calculated from data in *Ten Great Years*, pp. 21, 56.

D. Summary

The statistical tests advanced in this paper suggest that the decentralization measures introduced in the late 1950's did not have a significant impact on the ability of the central government to control the overall distribution of economic resources. Peking continued to use its control to pursue important economic goals, particularly the redistribution of investment resources and the subsidy of social expenditures of less developed areas. As a result the pattern of economic growth since the late 1950's is not one characterized by regional self-sufficiency and increasing inter-provincial inequality.

However, this empirical evidence allows us to draw conclusions with regard to the degree of central control only at a highly aggregated macroeconomic decisionmaking level. Clearly, this leaves room for possibly significant increases in local authority of a type that could not be reflected in the highly aggregated indicators presented above. In fact, considerable evidence suggests that the decentralization introduced in the late 1950's has increased local administrative responsibility and generally enhanced the economic powers of local governments and has contributed to improved economic efficiency.

VI. The Legacy of the 1958 Decentralization

Economic planning since 1958 has been marked by considerably more flexibility than in 1953–57. This has come about both because of the expansion of the scope of provincial economic plans and because of more flexibility in plan implementation. The expanded scope of provincial plans is the result of the widespread implementation of joint management of enterprises by the center and the localities since 1957. Increased flexibility in plan implementation has been facilitated by less centralized control of the system of commodity distribution, which also dates from the late 1950's.

Most of the enterprises transferred to provincial management in 1958 and 1959 were put under what is known as "dual leadership" rather than pure local administration. Under this system an enterprise is managed jointly by a central government ministry and the relevant local government, usually a province or a municipality. Although the center plays a major role in the determination of the plans of these enterprises, under the system of dual rule these enterprise plans are now incorporated into the plan of the relevant province as well. Thus, the widespread implementation of dual rule has increased the ability of local governments to carry out horizontal, geographic coordination of economic activities compared with the First Five-Year Plan period when these enterprises were managed completely by the center. For example, local labor bureaus are better able to coordinate the supply of labor within their administrative areas since enterprises under dual rule are now included in the local labor plan. This has improved labor planning within a given region compared to the First Five-Year Plan period when these enterprises operated independently of local labor bureaus in their hiring. Local governments also have a greater role in the coordination of material supplies within their regions. This has resulted in a reduction of the previous overlapping between the central and local distribution systems within a given area.

Economic planning since 1958 has also given local planners more freedom in determining the details of enterprises' product mix and in making the actual arrangements for meeting production targets. There is also somewhat greater local authority to change targets during plan implementation than during the First Five-Year Plan period when many more adjustments had to be centrally approved.

In spite of this increased role for local governments, there has been a substantial central government control of planning of production, commodity supply, and investment. The system of dual rule preserves a substantial role for the central government ministries and planning agencies. This was in fact alluded to by Chou En-lai when he first discussed the dual leadership formula for managing industrial enterprises as a means of enhancing local economic power. In his speech to the Eighth Party Congress in the fall of 1956 Chou explained that in some cases the center was to continue to play "the main role" while in others the local government was to assume greater responsibility.[31] However Chou did not specify how this determination would be made. In practice the key production targets for most enterprises are still apparently determined primarily by the central government ministries.

Similarly, although dual rule is linked to the sharing of enterprise profits by the center and the locality, this has not substantially enhanced local financial autonomy. The center continues to control aggregate provincial expenditures and enterprise profits are simply one of many revenue sources that are shared to provide financing for these approved expenditures. This continued control of provincial expenditure has been the key mechanism used by the center to control the distribution of fixed investment since the late 1950's. Since enterprises are still required to remit their profits and depreciation funds to the state, virtually all industrial investment depends on direct budgetary allocations. Up to 1958 the center controlled the sectoral and geographic distribution of investment largely through the budgets of its own ministries. Under the system of dual rule, investment allocations are financed through provincial budgets and are thus considered part of local rather than central government expenditures. However, the center continues to determine the overall sectoral and geographic distribution of investment funds, although this is now carried out through control of provincial expenditures rather than by more direct control of ministerial expenditures. Thus although dual leadership has resulted in an enhanced role for local economic coordination and administration, the center retains control over important economic levers.

Similarly, although the decentralization led to a considerably more relaxed system of commodity distribution, the center retains the means to determine the overall distribution of commodities. In 1959 the number of raw materials and intermediate goods subject to unified distribution by the state planning agencies and central government ministries was cut back by about two-thirds, to approximately the number of commodities centrally distributed in 1956.[32] Provincial governments were to exercise increased authority in the distribution of all commodities, but particularly those no longer subject to unified central allocation. However, at the same time the central government authorized central planning agencies and ministries to convene material allocation conferences to exercise continued indirect control over the

[31] Chou En-lai, "Report on the Proposals for the Second Five-Year Plan for the Development of the National Economy," in *Eighth National Congress of the Communist Party of China* (Peking: Foreign Languages Press, 1956), vol. 1, p. 311.

[32] She I-san, "A Discussion of the Reform of the Commodity Distribution System," p. 35.

distribution of commodities which were now being distributed by provincial governments.[33]

Material allocation conferences have emerged as a particularly important means of administering commodity distribution in the 1960's and 1970's.[34] Meetings are convened once or twice a year to bring together suppliers of important raw materials and intermediate goods with major enterprises which require these goods for meeting their production targets or investment plans. Significantly, however, these meetings are typically arranged on a functional, vertical basis rather than on a geographic basis and national planning agencies and ministries play a key organizing role. Thus they bring together all major suppliers and users of certain commodities from all over the nation rather than suppliers and users of all commodities within a single geographic region. Although there is little information available on how the actual contracts between enterprises are arranged at these conferences, the continuing role of national agencies and the branch lines of administration suggest that these conferences provide a mechanism for continued central government control of inter-provincial transfers of resources.

VII. Summary

The system of economic planning and management introduced in the late 1950's is perhaps most usefully understood as a combination of relatively decentralized day-to-day management combined with relatively centralized control of most basic resource allocation decisions. The widespread implementation of dual rule and the resulting enlargement of the scope of provincial economic plans has increased the ability of local governments to carry out a horizontal, geographic coordination of economic activities. However, the center has maintained control of many basic resource allocation decisions. This control is used to insure a high rate of overall investment, to allocate a large share of investment resources to the producer goods sector, and to achieve important equity and distributional goals.

The success of the Chinese planning and fiscal system in carrying out substantial geographic redistribution stands in contrast to India, another large state with a commitment to reducing inter-regional disparities.[35] Unlike the Chinese case, where all tax rates are set nationally, Indian state governments have some independent tax authority, giving rise to substantial inter-state variation in tax effort. Furthermore, the Indian planning and fiscal system does not contribute substantially to a reduction of inter-regional inequality. Poor states do not receive proportionately larger amounts of federal shared taxes and other forms of federal aid. The Chinese case, by contrast, is marked by greater uniformity in tax effort and a substantial redistribution through the fiscal and planning system.

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[33] State Council, "Several Regulations Concerning the Improvement of the Materials Distribution System," Sept. 24, 1958, *Compendium of Laws and Regulations of the People's Republic of China*, vol. 8, p. 100.

[34] Barry Richman, *Industrial Society in Communist China* (New York: Random House, 1968), pp. 712–718.

[35] Thomas J. Eapen, "Federal-State Fiscal Arrangements in India," in *Revenue Sharing and Its Alternatives: What Future for Fiscal Federalism?* Joint Economic Committee, U.S. Congress, 1967, vol. 1, p. 471.

CHINA'S ENVIRONOMICS: BACKING INTO ECOLOGICAL LEADERSHIP

By LEO A. ORLEANS

CONTENTS

COMMENTARY*

The quality of man's environment is usually impaired by man himself. He does this in two basic ways. First, by reproducing and thereby increasing the pressure of people on a given and finite land area; and second, by his determination to improve the economic and social conditions under which he lives through the utilization of scientific and technical knowledge as it becomes available to him—that is, "development." When the concern is limited to population density, environmental problems are essentially limited to sanitation, but with development and industrialization, a wide range of new hazards to environment is created. It should therefore be instructive to look at the People's Republic of China, where the world's largest population and impressive industrial development combine to create conditions that could, potentially, cause serious environmental degradation. There is another important reason to consider China's policies and programs as they relate to environment. Rightly or wrongly she has a reputation for having a real concern for the well-being of the individual and, in this regard, for following a course of economic development that has not ignored its consequences on environment. This paper will attempt to examine China's policies relating to the environment, to consider how successful she has been in implementing them, to look at the eco-

*I should like to express my thanks to Leon Slawecki of the Council on Environmental Quality for his comments and suggestions.

nomics of the problem, and finally, to comment on whether China will succeed in avoiding the environmental problems currently afflicting most Western industrialized nations.

China at the United Nations Conference on the Human Environment

As a backdrop to the review of China's domestic policies and programs in the environmental field, it is interesting to review the stance she has taken and the image she has projected to the international community.

The growing awareness on the part of the nations of the world regarding the accelerating degradation of the earth's environment culminated in a 2-week United Nations Conference on Human Environment, which took place in Stockholm in June 1972 and which was attended by 113 nations—in itself a significant milestone. Although one might reasonably assume that a conference whose aim is to improve the various aspects of man's relations with his physical surroundings would be apolitical enough to produce considerable unity even among representatives of diverse political and economic systems, this was not the case. Dissensions dominated the discussion both in and out of the official meeting.

In the consideration of environmental problems, just as in most other fields, there was a very fundamental difference in perspective between the rich and the poor countries—the developed and the developing countries. It was well summarized by Indira Gandhi when she wrote that "The rich countries may look upon development as the cause of environmental destruction, but to us it is one of the primary means of improving the environment for living, of providing food, water, sanitation and shelter, of making the deserts green and the mountains habitable."[1] And Maurice Strong, the Executive Directors of the United Nations Environment Program, presented the difference more graphically: "To a man faced with immediate starvation and other diseases of poverty, the risks he runs from contamination of the seas or the atmosphere seem so remote as to be irrelevant. To him factory smoke smells of money—and of jobs and needed consumer goods. And what if fly ash and sulfur dioxide afflict the surrounding area?"[2] In other words, the less developed countries (LDC's) are not prepared to accept the urging of the industrialized nations not to repeat their same mistakes, but to consider the problems of environment during the process of development rather than later when polultion becomes too difficult to manage. The LDC's are generally much more interested in development per se which, they feel, is the only way to bring material benefits to the population and they maintain that air and water pollution is a reasonable price to pay for such development. Furthermore, they attest that it is the rich who disturb the ecology and pollute the world, pointing out that one-third of the world's population consumes 85 percent of its resources, and quoting the estimate that a newborn child in the United States uses 25 times more of the world's resources than does one born in Asia, Africa or Latin America. The pollution of primary concern to LDC's is that of human misery due to poverty,

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[1] Indira Gandhi, "The Unfinished Revolution," *Bulletin of the Atomic Scientist*, September 1972.

[2] Maurice F. Strong, "One Year After Stockholm," *Foreign Affairs*, July 1973, p. 691.

malnutrition, disease, poor housing and illiteracy. These, they say, are the immediate problems of the third world, maintaining it would be both expensive and premature to alter national priorities in order to establish environmental standards urged by the West. No wonder it has been suggested that "to preach ecological prudence to an Asian or African leader would be tantamount to advising Mao Tse-tung to invest in the stock market." [3]

Dedicated environmentalists appreciate the argument but resent the attack on their motives. They point out that industralization along traditional lines does not necessarily solve the problems of poverty and misery among the masses. Rather, it tends to increase the gap between the poor, who suffer the most from social disintegration while benefiting the least from high-consumption-industrial goods, and the rich minority, who do profit from this type of development. Industrial pollution should not be considered a status symbol as LDC's leaders tend to believe. Aid for development should be continued, but local conditions and needs must be considered and the development undertaken within a more traditional framework. In other words, in response to the LDC's, it is possible to pursue development in a way that would minimize environmental risk.

Since the Cultural Revolution in 1966 representatives of the People's Republic of China had attended only a few scientific conferences and their participation, for the most part, was passive. There was understandable pleasure, therefore, on the part of the other countries when word came that China would be participating in the Conference on the Human Environment—the first major U.N. conference following her admittance to the U.N. (In a dispute over East Germany's unsuccessful attempt to gain admittance to the Conference, the Soviet Union ended up by boycotting it.) Because of China's reputation for concern for the quality of the environment and of human life, many felt that China would be a constructive contributor to the conference, able to suggest new solutions for many of the world's environmental problems. Those familiar with China's international tactics, however, predicted—correctly, as it turned out—that the dichotomy between the LDC's and the advanced nations was ideally suited for political capital, not to be passed up by Peking. Although a 27-nation Preparatory Committee (excluding China, who was not yet a member) spent 2 years on a carefully drafted United Nations Declaration on the Human Environment—one that was thought to be acceptable to all the participating nations—China's first parliamentary move at the conference was to call for the creation of a committee consisting of all 113 participants to review this draft and to consider China's 10 formal amendments to the Declaration. Actually most of the points made by China were not that different from the original sections of the Draft Declaration; they were simply restated in the inimicable style used by China when addressing the international community. An example of her intemperate language and her effort to politicize the conference was contained in Point 3 of the declaration:

> We hold that the major social root cause of environmental pollution is capitalism * * * seeking high profits, not concerned with the life or death of people,

[3] Richard A. Falk, *This Endangered Planet: Prospects and Proposals of Human Survival* (New York, Random House, 1971), p. 30.

and discharging poisons at will. It is the policies of the superpowers that have resulted in the most serious harm to the environment. The U.S. has committed serious abuses in Vietnam, killing and wounding many of its inhabitants. * * *[4]

Such attacks on the superpowers—often including completely irrelevant issues—garnered considerable support of the Third World nations. Also supported by the LDC's was China's insistence that the conference unequivocally affirm national sovereignty and the complete autonomy of each nation with respect to environmental standards—a point most upsetting to the environmentalists who believe in the philosophy that ecological networks inevitably cross national lines—"only one earth"—than to the representatives of governments.

Without detailing the heated disagreements prompted by China's introduction of what many considered to be extraneous issues (such as America's use of defoliants and mass-destruction weapons in Vietnam), it is enough to note that China's resolutions did not wreck the conference as feared. After almost a week of secret meetings, the Working Group managed to come up with a compromise acceptable to the Conference, and the Conference did eventually accomplish, basically, three major goals: (1) It approved a 7-point Declaration on Human Environment; (2) It approved 26 principles and 109 recommendations as part of the Action Plan for the Human Environment; and (3) It recommended the establishment of a new institution to coordinate environmental activities (United Nations Environmental Program [UNEP] in Nairobi, Kenya).

That China's rhetoric at the Stockholm Conference was not what might be considered constructive is not to suggest she had nothing to contribute to the forum. On the contrary, although China's experience with problems of environment has been uneven, she has nevertheless done much to promote a healthful environment and has done it in ways that are different enough to warrant study and consideration, particularly by other developing countries. In Stockholm, however, China's goal was to gain worldwide attention, to stress once again that "politics are in command" and to woo the sympathy of the developing countries by pointing out that environmental problems are solely the result of overconsumption and social and economic injustice as practiced by the advanced nations of the world.

Health and Sanitation

Because of the size of China's population and the incredibly poor conditions under which the people lived prior to 1949, the new regime's primary concern was not with fancy ecosystems—a distant concept of trivial priority—but rather with the simple and immediate requirements of improving the human environment at its most basic level. It was not with toxic materials released into the air and water or problems created by the indiscriminate use of energy and abuse of resources, but rather with living conditions in general and most specifically with problems relating to sanitation and public health. It is here perhaps more than in any other field that China has achieved the type of success to be envied not only by all the developing countries but also by many of the industrially advanced nations.

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[4] *Stockholm Conference Eco,* June 13, 1972, p. 5.

The Mass Campaigns

All visitors to China are duly impressed by the cleanliness of the country. What they are seeing are the results of a long and difficult struggle which began in the early 1950's and that is still going on.[5] Environmental sanitation was recognized as the single most important health problem in China, and prevention, rather than cure, as the practical approach to solving it. Chairman Mao called the people to "get mobilized, pay attention to hygiene, reduce disease, and improve health conditions"—and the first of many mass campaigns was on its way. Responding to both moral incentives and political pressures, hundreds of millions of people set out to clean up the country and learn the basic facts about sanitation, from washing hands, to the sanitary preparation of food, to the maintenance of clean homes and hygiene of the individual and the household. The cleanup campaigns involved all the mass organizations—such as trade unions, the Communist Youth League and women's federations—and were supported by all forms of propaganda from newspapers and radio broadcasts to lantern slides, posters, exhibitions, mass rallies, and so forth. Although a more conventional battle against disease was also waged by "epidemic prevention stations" which were established throughout the country to conduct massive immunization programs and by medical researchers in hospitals and at the institutes of the Chinese Academy of Medical Sciences, practical considerations led the leadership to oppose "the erroneous viewpoint that large sums of money, more chemicals and apparatus and numerous experts are needed to improve sanitary conditions"[6] and to place major emphasis on the organization of intensive mass participation in sanitation.

One aspect of the early campaigns which received the most waggish publicity outside China was the goal to exterminate all flies, mosquitoes, rats, and sparrows. Few observers believed that the four pests or "four evils" could be eliminated in the first place, and some of the fantastic statistics reporting success in terms of numbers or weight of the "kill" usually elicited only smiles. China did, however, mobilize every house hold for this task and over the years managed essentially to achieve the impossible and rid the country of these pests and at the same time to "raise the people's consciousness with regard to the need for general cleanliness." As a matter of fact, the successful reduction of the sparrow population resulted in an unforeseen disruption of the natural equilibrium of the environment. The annual grain available for human consumption was initially increased as anticipated, but the campaign did not take into consideration the service the sparrows perform by eating injurious insects. The insects multiplied and the losses of grain increased. Belatedly, after most had been killed, sparrows were proclaimed "rehabilitated" and deleted from the "four evils" list; their place was taken by bedbugs or other vermin—depending on local conditions.

Parasitic diseases, such as schistosomiasis, malaria, kala-azar, and hookworm, which affected the health and lives of literally hundreds

[5] For a detailed discussion of developments in health and sanitation, see: Leo A. Orleans, *Health Policies and Services in China, 1974*, report to the Subcommittee on Health, U.S. Senate, March 1974.

[6] New China News Agency, Feb. 12, 1958, hereafter referred to as NCNA. Unless otherwise specified, all NCNA reports are from *Daily Report: China*, published by the Foreign Broadcast Information Service, hereafter referred to as FBIS.

of millions of people in China, were also attacked through education and mass mobilization. Probably the best example of the efforts may be seen in the fight against schistosomiasis which, in the past, affected entire communities in some of the counties along the Yantgze River. People were urged to "bury, burn, boil, and chemically dispose" of the snails that carry the disease—and they did. Where but in China could the authorities of just one province (Anhwei) mobilize 1.5 million persons to spend 20 million man-days in such a task over a period of just several months? [7] And Anhwei is not an unusual province, nor was that year, 1956, an unusual year.

Since the first "Patriotic Health" movement in 1952 and the subsequent "shock attacks" in support of whatever health projects were considered at the time to be most important, there was never a letup on the "Keep China Clean" program. Even now, the slogan is "grasp the patriotic health movement several times a year"; it is a regular practice to launch the "autumn health movement" and the "spring cleaning movement" to remind people to keep themselves and their homes clean, to continue the battle against the four pests, and to strengthen the controls over drinking water and foods and the disposal of human excrement. Thus, every spring and fall reports from China tell us of the millions of people who have participated in the cleanup in every city and commune, providing statistics on the tons of garbage and trash cleared away, the length of ditches and sewer pipes that were cleaned, the number of mosquito-breeding grounds that were "handled," and so forth.

Control and Disposal of Night Soil

The ignorance and low level of personal hygiene and the widespread use of animal and human wastes as fertilizer, combined to make fecal-borne diseases primary causes of death in rural China. Schistosomiasis, hookworm, kala-azar, and many other parasitic diseases thrived under conditions where:

> people were poor and lacked sanitary knowledge. Farmers were working in the fields barehanded and barefooted. Children stooled freely. The fresh manure was used as fertilizer. All these factors caused the epidemic conditions.[8]

The collection of both rural and urban fecal material and its spread over most of China's agricultural lands resulted in a pollution of the fields that made it impossible for people to avoid infection.

After 1949, the control and disposal of night soil became another major responsibility of the health and sanitation personnel. An extensive education program was initiated to teach people the danger of contact with raw excrement. Literally millions of newly covered latrines were built and covered cesspools were dug for the collection of human and animal waste on the outskirts of villages. An effort was made to distribute chemicals for the treatment of excrement, peasants were taught not to use it as fertilizer until it had been stored from

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[7] NCNA, June 1, 1956; in *Current Background*, No. 405, July 26, 1956.

[8] *Jen-min Pao-chien (People's Health)*, Vol. 1, 1959, hereafter referred to as *JMPC*; in *Joint Publications Research Service*, No. 5104, July 27, 1960, hereafter referred to as *JPRS*. For a description of the traditional ways of collecting and utilizing night soil, see: Gerald F. Winfield, *China: The Land and the People* (New York: William Sloane Associates, Inc., 1948).

2 to 8 weeks, depending on the season, and were urged to "observe each other in order to achieve this purpose." Public health and science journals carried numerous articles instructing the population on improving the management of manure and water, discussing the selection of latrine sites, the necessity to dig drainage ditches around the latrines, the structure of the latrines, the sizes of pits—all with technical drawings and illustrations. Achievements were reported in detailed statistics: 938,320 receptacles were constructed for night soil in Kiangsi Province, and there were 1,361 hsiang in Kiangsi and 153,473 households in Anhwei "in which night soil is properly controlled, and the situation is maintained on a regular basis." [9] One interesting calculation reported in the People's Daily stated that "* * * if the manure and urine of the entire populace of China are fully utilized, these ingredients will correspond to some 10 million tons of ammonium sulfate, or about the annual output of scores of chemical fertilizer plants." [10]

Despite the increasing production and importation of chemical fertilizers, their availability is still inadequate and China's farmers are just as dependent as they ever were on animal dung, household manure, green manure, and mud from the rivers and ponds to fertilize their fields. Every spring, for example, a mass movement to accumulate manure is initiated in rural China. In some localities well over half of the total labor force is rounded up to move manure accumulated during the winter months to the fields. During the height of the mass effort to "accumulate and deliver manure in a big way," large numbers of urban workers and employees are called to participate in the campaign—what better way to shed possible remnants of elitist thoughts.[11] The difference, however, is that now most of the spreading is done under strict directives and supervision of public health personnel and great precautions are taken to insure that the manure accumulated over the months is properly cured, chemically treated, and environmentally safe.

Urban Sewage Disposal

Information on urban sewage disposal facilities in China is scanty indeed. Prior to 1949 only the largest cities in China had sewerage systems and even they served only a small part of the population that lived in the central, more modern sections of the city. In most of China's urban areas, untreated sewage was dumped directly into the rivers or was transported via "honey buckets" to fertilize adjacent fields. In northern cities only solid fecal material was collected, carried to the edge of the city and dried into thin cakes containing considerable amounts of nitrogen.[12]

Although large-scale construction of sewerage systems began in many cities during the 1950's, for the most part it was associated with new workers' housing developments on the periphery of the cities, bypassing the old crowded neighborhoods comprised of single-story dwellings and populated by most of the urban families.

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[9] NCNA, June 1, 1956; in *Current Background*, No. 405, July 26, 1956.
[10] *Jenmin Jih-pao* (*People's Daily*), Nov. 5, 1965, hereafter referred to as *JMJP*; in *JPRS*, No. 33, 484, Dec. 27, 1965.
[11] A number of articles on this subject were translated in *Union Research Service*, Hong Kong; see, for example: "The Vigorous Movement of Accumulating Manure," Mar. 9, 1973, and "Accumulation of Manure in Rice-Producing Areas of China," May 10, 1974.
[12] Winfield, p. 257.

The first attempt to irrigate extensively with urban sewage was made in 1956 around Chuchow in Hunan Province.[13] Apparently it was a successful experiment to assist with agricultural production and at the same time to decrease pollution of rivers: a couple of years later, during the Great Leap, there was a rapid increase in the use of urban sewage for irrigation and fertilization of fields adjacent to large cities—an ideal example of transforming "what is harmful and useless into something that is harmless and useful." It was soon discovered, however, that the process was not harmless. The widespread use of raw urban sewage on the fields increased the number of flies and mosquitoes and resulted in a serious setback in the battle to control fecal-borne diseases. Furthermore, tests proved that sewage irrigation tended to contaminate water wells and drastically increase the bacterial count of the well water. New directives had to be issued warning against over-irrigation with sewage, against the use of untreated sewage on fields just prior to harvesting and introducing new technical controls and sanitary standards for wells.[14] The basic problems were obviously solved; by 1966, 43 Chinese cities were developing agricultural irrigation by utilizing treated urban sewage and claiming substantial increases in farm yields.[15] One of these cities—Changchun, in Kirin Province—now reports that 90 percent of its waste water is carried by pipe and irrigation channels into the fields. The city leadership estimates that the nitrate and phosphate contained in this waste saves the communes 3,500 tons of chemical fertilizer a year.[16]

China has made significant advances in the disposal of urban sewage but, as in all other accomplishments, this one too must be placed in perspective. The most impressive accomplishment is simply that urban waste produced by some 150 million people is disposed of by essentially sanitary methods, both modern and primitive. The claim that all urban sewage is now treated either by a mechanical process in which it is settled and then disinfected with chlorine before discharge into a watercourse, or through biological treatment which involves screening and subjecting it to oxidation and then chlorination [17] is an exaggeration. A report that describes the 30-kilometer-long pipe that carries 300,000 tons of waste water and sewage from Shanghai to irrigate farmland, for example, also admits that prior to the Cultural Revolution because of the "renegable, hidden traitor and scab Liu Shao-chi," "Shanghai did nothing to treat the sewage but let it pollute the Whangpoo River." [18] And that was only a few years ago.

At present it would appear that all large cities have a sewerage system to serve the center of the city and the new apartments, offices, and factories built on the outskirts. The old districts, however, populated by most of the workers, still rely on "honey buckets" or trucks to carry the waste out of the city— and it is not unusual to see this process in operation just a few blocks from Tien An-men Square in

[13] *China Reconstructs*, Peking, June 1965, hereafter referred to as *CR*.
[14] *JMPC*, No. 3, 1960; *JPRS*, No. 2976, July 15, 1960.
[15] NCNA, Apr. 15, 1966.
[16] *CR*, November 1971.
[17] *CR*, June 1965.
[18] NCNA, Feb. 25, 1972. By way of comparison, it is interesting to note that even in affluent Tokyo, only 36 percent of the city is connected to the sewerage system, while in Manila it is down to 12 percent. (Economic Commission for Asia and the Far East, *The Regional Seminar on Ecological Implications of Rural and Urban Population Growth*, Asian Population Studies Series No. 10, Bangkok, 1971, p. 13.

the center of Peking. China's middle-sized and small towns, of course, also employ the more traditional methods. Furthermore, there have been interesting reports based on refugee interviews in Hong Kong about a black market in human excrement—arrangements made by representatives of rural brigades to buy human waste directly from individual urban households. If true, it is certainly a comment on the shortage of fertilizer even in close-in communes, on the continuing private initiative and enterprise of the Chinese peasants and on the willingness of both the sellers and the buyers to take certain risks for personal profit.

A few words about garbage. Since China is not a consumer-oriented society, neither the volume nor the content of the garbage in Chinese cities compares to that in the West. There are few plastic or metal containers and throw-away bottles are unknown. Everything that is fixable is fixed and anything that is reusable is salvaged. For the most part, then, garbage is organic in nature.

Peking, of course, has a larger volume of garbage than most Chinese cities. The method of handling its waste, however, is probably quite typical of that used in other large cities. Inhabitants in streets and lanes dump their garbage at appointed spots every evening where it is picked up daily. One method is to collect it by truck and take to the communes where the peasants clear it of hard materials, add to it farmyard manure and then seal the dumps with clay to ensure fermentation within 50 to 60 days. The 22 such sites on the outskirts of Peking convert the 2,700 tons of garbage picked up daily into 2 million tons of compost annually, which is distributed to 36 communes and 80 state farms.[19] Another report says nothing of sealing the dumps with clay; rather, the garbage is simply packed firmly in large heaps where fermentation takes place. There are 48 garbage disposal yards of this type located on the outskirts of Peking.[20] That garbage is disposed of efficiently is substantiated by the fact that rarely does a visitor to China see or smell refuse along the side streets or alleys of China's cities.

The Environment and China's Land

It has been said that "to govern the water is to govern the country" and the battle with water has been going on throughout most of China's long history. Her excellent historical records show, for example, that in the past 2,000 years, the Yellow River Valley suffered 1,500 floods and 1,070 droughts. Considering the devastation, the families, and the losses of hundreds of thousands, even millions of lives that usually followed these disasters, it is easy to understand why the Chinese do not forget. Since 1949, the government and the people have expended enormous amounts of money and labor on innumerable and varying sized projects aimed at controlling China's water resources in order to prevent major disasters resulting from floods and droughts, to stop erosion and alkalinization of the soil, and to reclaim and expand the land that, over hundreds of years, has been lost to agriculture.

China's approach to water and land conservation seems to follow the advice of "The Foolish Old Man Who Removed the Mountains"—in the ancient Chinese fable made so famous by Mao. Very briefly, when the old man was told how silly he was to try (with his sons)

[19] NCNA, Feb. 25, 1972.
[20] NCNA, Jan. 3, 1972.

to remove two mountains that were obstructing his view, he replied: "When I die, my sons will carry on; when they die, there will be my grandsons, and then their sons and grandsons, and so on to infinity. High as they are, the mountains cannot grow any higher and with every bit we dig they will be that much lower." In their efforts to implement the government's water and land conservation policies the Chinese population has been digging for 25 years now. The problems are huge and progress is often slow because of poor planning and management (the Chinese themselves admit that "some of our water projects went off on the wrong track") but, although the effort is likely to be a never-ending one, impressive progress is being made, and gradually China's environment is changing.

Irrigation and Water Conservation

Although several major projects were initiated during the early 1950's, most of the early emphasis was on temporary measures such as the strengthening of existing dikes and on other "key point" projects to prevent, if possible, any new major disasters. Most of this activity centered in the flood-prone areas of central and northern China and met with only limited success and many problems. China did not yet have enough specialists to study the local topographical and climatic conditions and to plan and coordinate the work. Too many irrigation canals and not enough drainage canals resulted in seepage, waterlogging, and accentuated alkalinization. Many of the water-control projects were abandoned before completion.

More care was given to the larger water conservation works of national significance—many of them started during the First Five-Year Plan (1953–57). Special organizations were named to draw up plans and lead the work for the control of major river systems—the Yangtze, the Huai, the Haiho, and the Yellow ("China's Sorrow") Rivers. It was also during the early 1950's that work was started on the enormous People's Victory Canal which, over the years, has grown to include a 7,500-kilometer network of irrigation and drainage canals, some 2,600 pump wells, irrigating some 600,000 mou of farmland.[21]

In general, China's approach to water conservation (as in most everything) is to "walk on two legs." The first "leg" concentrates on small projects that are the responsibility of local administrative units, such as communes and production brigades, and that use local resources for the task. The other "leg" is undertaken by the central government and includes "large-size backbone projects," such as large reservoirs, dams, flood-diversion projects, and other major undertakings which require considerable capital and resources. Theoretically, both types of projects are undertaken with a broad plan in mind, somehow linking the various projects into a unified water control scheme—an ever-present predicament for the planners and the builders.

Chinese sources probably provide more information on what is being done in the field of water and land conservation than on any other economic activity and one is apt to wonder whether, even with 800 million people, it is possible to accomplish all the undertakings reported. During the slack agricultural season every commune in the

[21] NCNA, Oct. 28, 1972. 1 mou=1/15 hectare=1/6 acre.

country becomes involved in rural capital construction; this usually has to do with water conservation and land reclamation or improvement. Over the period of a year, as many as 200 million people with picks and shovels are likely to spend literally billions of man-days moving immense mounds of earth in baskets and handcarts. They dig canals, aqueducts, and new riverbeds; they spend years trying to cure alkali lands; they level ground and terrace hillsides; they deep-plow. They do all this mostly in the winter and early spring, which poses still additional problems in the north and northeast where much of the ground is "so frozen it has to be cracked with sledge hammers."

The Chinese point to some important advantages to be gained by concentrating on "small water conservation projects built on a large scale"—that is, locally initiated projects under the principle of self-reliance. The projects get quick results at minimal expense (the masses bring their own tools and grain rations), they are easy to carry out and popularize, they can be accomplished at high elevations to bring water to odd pieces of land and they are easier to manage and safeguard.[22] Apparently, however, there are problems of motivation. Just as in their work in agriculture, the peasants receive work points (rather than wages) which are recorded by the commune. The complaint is that in "some areas" (a vague term that usually implies more than a local problem) earthmoving activities earn fewer work points than does agricultural work—apparently considered unfair and creating serious morale problems.[23]

Statistics abound on local achievements in water conservancy and just a few examples should illustrate the nature of the various activities. In the past 2 years, in Shansi Province, 25,000 new mechanical and power-operated wells were sunk and 3,500 mechanical and power-operated irrigation stations were built.[24] According to reports from eight northern provinces and regions, 2 million hectares of arid farmland were put under irrigation in the winter of 1965–66.[25] One commune in Szechwan Province, in a period of a couple of years, built 9 mountain ponds, dug 16 canals and increased water storage capacity by 143,000 cubic meters.[26] In less than 2 months, an average of 100,000 laborers in one hsien of Honan Province moved 8 million cubic meters of earth.[27] The figures themselves in these and hundreds of other reports are almost incidental, but they do indicate the emphasis on water conservation and the intensity of the work.

Not all the water conservation efforts rely on local resources and initiative and the other leg—the one that relies on large government-funded projects—has also been very active. Most of the comprehensive efforts have been concentrated on China's great rivers, the Huai, Hwang-ho (Yellow), Haiho, and the Yangtze. Vast national schemes are designed to transform whole regions by controlling floods, irrigat-

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[22] *Shui-li Yu Tien-li (Water Conservation and Electric Power)*, No. 3, Feb. 5, 1966; in *Survey of China Mainland Magazines*, No. 566, Mar. 6, 1967.

[23] An example of the problem of motivation came out in a report from Fukien Province, where "because of the agitation by a handful of class enemies" most of the labor force "went out to undertake individual work and sideline occupations"—a much more profitable endeavor—rather than working on a drainage project in the brigade (NCNA, Jan. 10, 1974; in *Union Research Service*, vol. 74, No. 19, May 5, 1974).

[24] NCNA, Dec. 24, 1972.

[25] NCNA, June 11, 1966.

[26] NCNA, Jan. 20, 1973.

[27] *Shui-li Yu Tien-li (Water Conservation and Electric Power)*, No. 8, Apr. 20, 1966; in *JPRS*, No. 40,614, Apr. 13, 1967.

ing extensive areas, creating navigable waterways, and generating large amounts of hydroelectric power. The widespread transformation of the countryside was recently summarized as follows:

> Today there are 1,700 reservoirs of large and medium size located in China's mountainous and hilly areas, and small ones by the tens of thousands. In the major river basins there are 130,000 kilometers of dikes, newly built or strengthened, and close to 100 big canals for draining away floodwater. Throughout the country equipment with a total of 20 million horsepower is in use in electric irrigation and drainage stations. Wells with pumps have exceeded 900,000 in number.[28]

These achievements are indeed impressive, but since China's needs still appear almost limitless, tremendous amounts of capital will yet have to be spent on major water control projects, and there will be plenty of work left for the sons and grandsons of the Foolish Old Man.

Land Reclamation

Intimately related to water conservation and irrigation are China's efforts to increase agricultural acreage, which is still estimated at not much more than 11 percent of the country's total area. In the early 1950's, considerable optimism was expressed in many Chinese publications about the possibility of expanding arable land and some rather fantastic figures were suggested for the amount of land available for reclamation. Experience quickly proved, however, that large reclamation projects in the more remote, sparsely settled provinces had to overcome too many natural obstacles and were economically impractical. Primary emphasis, therefore, is placed on increasing the productivity of existing agricultural lands, while most of the reclamation is limited to extending these lands gradually through terracing up the slopes of mountains and into the more marginal, but still adjacent, regions. It must be remembered, however, that when the Chinese refer to reclaimable wastelands, they include not only agriculture but any piece of land which, through the application of labor and perhaps limited capital, can in some way be made productive. A reasonable concept. As in the case of water conservation, most of these activities take place during the agricultural off season and with a large labor force that does not have to be moved to distant areas.

Typical in some areas are the numerous projects to reclaim alkali and marshy lands—efforts that require tremendous amounts of human labor and perseverance. A brigade in Anhwei Province, for example, whose land was over 90 percent saline-alkaline, started, in 1964, to "battle heaven and earth to transform nature" and after six years of hardship and struggle managed to transform 1,585 *mou* of alkaline land into 1,000 *mou* of fertile farmland. One hundred thousand man-days were spent just on moving earth in this project.[29] There are also many projects undertaken to control the spread of the deserts, such as was recently reported in Tunhuang county in Kansu Province. Here they have rescued agricultural land from the encroaching desert by controlling the shifting sands first by planting bushes, then trees; and digging canals to bring water from nearby mountains.[30] Some 1,000,000 persons in Heilungkiang Province worked on creating

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[28] CR, January 1973, p. 13.
[29] *K'o-hsueh Shih-yen* (*Scientific Experiment*), No. 3, 1972; in *JPRS*, No. 57,640, Nov. 30, 1972.
[30] *CR*, January 1973, p. 19.

new farmland in the spring of 1974. A total of 100 million cubic meters of earth and stone work was completed. The province has also succeeded in improving the soil fertility of some 5 million *mou* of farmland.[31]

Some of the most difficult land reclamation projects seem to be undertaken by the various units of the People's Liberation Army (PLA), which are often located in remote areas. These units are able to devote more time and effort to activities considered to be economically impractical in order to prove that, through hard work, it is possible to become self-sufficient in agricultural needs. One Production and Construction Corps which was stationed in distant Sinkiang Province near the Soviet border has, since 1949, reportedly transformed 10 million mou of "primitive desert into fertile lands surrounded by dense forests." [32] Another PLA unit near aCnton has been reclaiming coastal land which had often been submerged by high tide. Perhaps not a very efficient expenditure of time, but the soldiers have succeeded in building a long sea dike, clearing the land of debris, leveling it and carving out canals and ditches to bring fresh water to wash away the saline content of the soil. Now they are growing two crops of rice every year on this land.[33] When the Chinese talk about "building farmland," they mean it literally.

The model for all of China when it comes to land reclamation (as well as perseverance and hard work) is the Tachai production brigade located on poor, badly eroded slopes in Shansi Province. Over a period of many years and after numerous hardships and disasters, the brigade has leveled hilltops, built stone walls, terraced fields, carried compost, and deep-plowed, irrigated, and fertilized the land until it has become a rich brigade producing surplus grain, growing fruit and timber, and raising draft animals and pigs. "Learn from Tachai" is a slogan one hears throughout China. For every reported success story such as Tachai there are undoubtedly several failures, but most such projects probably fall into the "less than success and more than failure" category.

Afforestation

Over thousands of years, the growing population of China, the expanding area cultivated by the farmers and the ever-increasing demand for lumber for fuel and construction have caused widespread deforestation of the country with predictably adverse effects on the environment. It is estimated that less than 10 years of the Chinese land mass is covered by forest; the percentage of forest cover in some of the eastern, densely-populated provinces such as Hopei has become insignificant. Deforestation, in turn, has resulted in flooding and soil erosion with serious effects on agricultural production. Thus, the need for afforestation was well recognized by the regime as an important economic need and correlate to soil and water conservation programs.

By the end of the First Five-Year Plan, the afforestation program was already in full swing, and it was reported that between 1953 and 1957 169,350,000 mou of trees were planted.[34] In many parts of China,

[31] NCNA, July 23, 1974.
[32] NCNA, Mar. 13, 1966.
[33] NCNA, Feb. 25, 1966.
[34] *Peking Review*, No. 8, Apr. 22, 1958, p. 15; hereafter referred to as *PR*. The distribution of the planted trees in rounded millions of *mou* is as follows: timber—77, industrial trees—32, shelter belts—22, water and soil conservation—21, and miscellaneous—16.

and especially in the western provinces, wide tree-sheltered belts were planted. The members of the Communist Youth League in the provinces of Shensi, Kansu, Shansi, Inner Mongolia, and Honan, for example, "together with adults and old people planted trees and formed forests on over 30 million mou of land." In Honan Province alone some 4.8 million youths were involved in this activity.[35] As already mentioned, large projects were undertaken in the fight to control shifting sands in desert areas and forestry experts, with the help of tens of thousands of people, have created shelter belts between western Inner Mongolia and the Ninghsia Hui Autonomous Region.[36] and on the sandy wastes created by the flooding of the Yellow River.[37]

Afforestation work continues and Chairman Mao's call to "make the motherland green" recurs every year. The mass planting campaigns are supplemented by more professional activities of the numerous forestry bureaus and state forestry farms. National Forestry Conferences annually disseminate the latest information in the aerial sowing of tree seeds, on grafting, and on a variety of new techniques developed for the scientific management of forests.[38]

The Chinese admit that much of the early, labor-intensive efforts to plant trees was wasted and that the survival of planted but uncared for seedlings was low. It seems, however, that the management of afforestation is improving. Mass planting continues, but much more attention is now being given to the care of trees after they are planted. Whether or not China meets her rising demands for forestry products is immaterial within the context of this paper, but there is no doubt that the billions of trees planted in the past 25 years have served to reduce damage by drought and flood and have helped to conserve soil and water. It is also true that the present day visitor flying across rural China cannot help but be impressed by the miles upon miles of tree-shaded roads that seem to criss-cross the countryside.

Pollution by Pesticides

In her perpetual battle to increase food production, China has greatly increased her production and use of insecticides and other chemical substances in agriculture which are hazardous to man and animal life. The production of all pesticides increased rapidly during the late 1950's [39] and probably through the 1960's. Here, then, is a source of pollution, nonexistent in the past, and now recognized and listed by China as one of its three primary categories of pollution. What are the Chinese doing about it?

Considering the overwhelming priority China must give its agriculture, she is not likely to restrict the use of DDT or other chemicals to control her pest and disease problems unless she can find an appropriate substitute. In the meantime there is an attempt to introduce certain precautionary measures. It has been suggested that violent poisons such as organic phosphorous compounds be forbidden or limited, that pesticides not be used during a certain period before harvest and that close watch be maintained over quantities, concentrations,

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[35] *Chung-kuo Ch'ing-nien Pao* (*China Youth Daily*), Mar. 1, 1966; in *JPRS*, No. 36, 342.
[36] NCNA, Apr. 24, 1966.
[37] NCNA, May 15, 1966.
[38] NCNA, Mar. 10, 1966.
[39] See: Owen L. Dawson, *Communist China's Agriculture* (New York: Praeger Publishers, 1970), p. 109.

and frequency and method of application of various pesticides.[40] How widely these suggestions are disseminated and how closely they are complied with is, of course, not known.

At the same time, China's concern over this type of pollution is perhaps most clearly revealed by the research her scientists are conducting to find alternatives to chemicals now used in agriculture. "Energetic research on a pesticide to replace DDT is needed," they assert, and "the search for low-toxicity and low-residual-toxicity agricultural pesticides is a subject at present being actively pursued." [41]

Chinese scientists seem to have made significant progress in the use of biological pest control methods. In south China's Leicho Peninsula a production brigade is reported to have achieved good results by breeding parasitic bees to destroy insects harmful to rice. These bees are put into paddy-fields to lay their eggs at a time when the insects are proliferating. Ten days after they are hatched the young bees feed on the insects' eggs, destroying them.[42] Another example is reported by the Shanghai Institute of Entomology, which has been experimenting with the use of insect sex attractants as an alternative to organic phosphate and chlorodane pesticides in the control of agricultural pests.[43]

Coping with pollution resulting from the use of insecticides is a very practical problem well suited to "revolutionary research" by China's scientists. Since DDT (the most widely used insecticide) is insoluble in water but accumulates in the fat of animals, pesticides washed by rains into rivers and ponds can seriously affect fish and duck breeding and be a hazard to livestock and wildlife. This direct danger to China's food and health could very well inspire Chinese science to come up with some new insect controls meriting worldwide attention.

Nature Conservation

China has many unique areas that have fauna and flora worthy of protection, but one is not likely to find much information on nature conservation in Chinese publications. The People's Republic claims that after 1949 the country adopted a wildlife policy of "preservation, breeding in captivity and hunting in a planned way" and the few references that are available would suggest that, indeed, she is making some effort to protect rare animals. Not surprisingly, the preservation of the giant panda gets the most publicity and a number of natural reserves have been created where pandas are protected and where scientists can observe and research the animals. Other animals which were close to extinction and are now likely to be protected include the golden monkey in southwest China, some small herds of wild horses still remaining in Inner Mongolia and Sinkiang, the goat antelope along the Tibetan border and certain species of pheasants and other rare birds. The great paddlefish of the Yangtze River and the giant salamander which lives in the western part of the country can now be found only in China and are also probably protected.

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[40] *Chih-wo-hsueh Tsa-chih* (*Botanical Journal*), vol. 1, No. 2, May 1974.

[41] *Hua-hsueh T'ung-pao* (*Bulletin of Chemistry*) Jan. 23, 1974; in *JPRS*, No. 62,812, Sept. 26, 1974.

[42] *PR*, No. 3, Jan. 21, 1972.

[43] *K'o-hsueh Shih-yen* (*Scientific Experiment*), No. 6, June 1974; in *JPRS*, No. 63,149, Oct. 8, 1974.

If China is making any efforts to preserve some species of flora or to set aside natural areas that are, in some way, unique, she is keeping it a secret. Since nature conservation does not provide any immediate economic benefit and is not a concern that is directly related to development, it would be most unlikely that the leadership of any developing country with their numerous pressing priorities would consider the protection of natural vegetation or areas of unusual beauty as important enough to merit consideration. Nature conservation would be an ideal subject for many of China's publications, especially those that cater to foreign audiences. The fact that they have not been writing would suggest that they are not been doing much in this area. This may very well change, however. Now that Principles 2 and 4 of the Stockholm Conference Declaration (complemented by relevant sections of the Action Plan) have stressed man's responsibility to "safeguard and wisely manage the heritage of wildlife and its habitat," it is very possible that China will become more active in the preservation of animals and plants.If this happens, the world will soon know about it.

Industrial Pollution

Chinese articles reporting current achievements in the fight against pollution usually start with the repeated complaint: "in the past" serious health problems resulted from factories and plants that poured waste gases into the air, dumped slag, cinders and ashes into ravines and ditches and let waste water flow into streams and rivers. As far as it goes, the statement is, of course, correct, but since China's cities were essentially political and commercial centers, environmental damage done by industrial pollution was insignificant in national terms and limited primarily to some of the larger eastern cities. In most urban areas, as in the countryside, the main health problems were the result of organic, rather than inorganic, pollution caused by lack of sanitation and the prevalence of diseases.

The growth of China's industrial activities after 1949 accelerated local pollution poblems and initiated some concern over its effects on the health of the population. During the First Five-Year Plan, the various health departments became increasingly involved with controlling industrial wastes, issuing directives relating to health standards of industrial plants, identifying technical processes considered to be dangerous and urging that the location of new plants take into account environmental considerations.[44] Although with the installation of some purification and recovery facilities the really serious aspects were usually covered, in general, the health departments, so successful in other sanitation programs, were waging a losing battle against industrial pollution. Industries were growing rapidly and long-term or future health problems could not compete with the more immediate economic priorities.

It was not until the mid-1960's—when the problems of industrial pollution were integrated with the intensification of Mao's often-quoted exhortation to "struggle against waste," and when an improvement in the environment became the responsibility not just of the public health departments but also of the various economic ministries and production units—that the battle against the haphazard disposal of inorganic

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[44] *JMPC,* vol. 1, No. 10, Oct. 1959 ; in *JPRS,* No. 2745, June 10, 1960.

industrial waste began to show some results. This is not to say that health considerations were not also present or that the Chinese were not aware of the salutory effects of the fight against industrial pollution on the quality of air, water and land. It is to say, however, that the importance of these latter benefits (which gradually became dominant in so many of China's official statements) were considered to be almost a bonus and that the primary impetus for the program was, and continues to be, overwhelmingly economic.

The thrust of the current campaign may be seen from the slogans which constantly remind the workers of their responsibilities. They are urged to wage a battle against the "three wastes": waste liquid, waste gas and waste slag. They are told that with some effort on the part of the population it is possible to "change wastes into treasures and turn harmful into beneficial." Factories are called on "to take one trade in the main and run various undertakings," which means that in addition to producing their primary product they should collect all waste materials from the production process and, through local innovation and experimentation, try to make full use of them. The production units are further encouraged to do this at a minimal cost, by using local resouces and indigenous methods—through "self-reliance and hard struggle." Let us take a look at just how China is "turning the harmful into the beneficial" in her drive to make comprehensive use of waste materials.

Air

It would be easy to assume that in a country where only 15 percent of the population live in urban areas and where vehicular traffic is insignificant, air pollution would not be a serious problem. In fact, it isn't, for most people—but those who live in the large industrial centers have had to breathe air that is as bad as is likely to be found anywhere in the world. The normal pollution of industry is greatly intensified by the widespread use of coal for both power and heat, and China's northern cities in particular are notorious for the constant heavy pall of pollution, which becomes incredibly heavy in winter. Despite these conditions, almost every general discussion by China of pollution starts with the prescribed ridicule of the United States and the Soviet Union as the world's largest air-polluting countries and reminds the readers that air pollution is an incurable disease of capitalism, as practiced both in the West and by the "socialist imperialists." No mention, of course, is made of the many successes outside China to control air pollution: the profit motive which dominates capitalist societies could not possibly, according to Peking, permit the installation of costly air-cleaning equipment simply for the benefit of the health of the people.

How well are the Chinese progressing toward improving the quality of air in urban centers? In the 1950's, comments and discussions dealing with air pollution were pretty much limited to the public health journals. Factories were urged to take steps to control unnecessary air pollution, suggestions were made to the people to take preventive health measures, ministries were encouraged, when possible, to build new factories "on the opposite side of the city from which the wind usually blows." But, although some local achievements were reported, economic priorities predominated and, not unlike their Western capitalist counterparts, Chinese managers of factories, who are also judged by their ability to show "profit," were reluctant to spend limited capital in ways that would not reflect higher productivity.

During the late 1960's, there was relatively little talk of pollution in China, and after the Cultural Revolution the authorities admitted that "efforts to control industrial pollution were not very successful due to interference and sabotage by swindlers like Liu Shao-chi." [45] It was in 1970 and 1971 then, that the real push for improved air quality began to gather momentum—undoubtedly reducing but by no means eliminating air pollution. Thus, there is both good news and bad news to consider.

A Shanghai newspaper reports that 1,500 chimneys in the municipality no longer spew black smoke. They represent a fraction of an unknown total number of chimneys in this large city and the article therefore goes on to challenge other units to do likewise.[46] But this is not an easy challenge to meet. From the numerous reports one surmises that China does not yet produce (at least, not in any quantity) any gas-cleansing equipment, and that each enterprise or unit must handle the problem through self-reliance. Thus, in the same city of Shanghai, the workers of one workshop of an iron and steel plant "devised an apparatus that eliminates over 90 percent of the soot"; the workers of an electrochemical plant developed their own innovation to handle the soot; while still other workers made soot-cleaning apparatuses out of discarded materials.[47] The effectiveness and permanence of all this do-it-yourself type of equipment are questionable. Certainly if the reports of important achievements in smoke elimination were permanent and factual there would not be enough air pollution left for significant achievements to be reported the next year and the year after. Yet, there continues to be room for improvement. For example, in 1972 a conference on smoke abatement was held in Shenyang, a heavy-industry city in northeast China, at which it was stated that steel plants, chemical works, mines and other industrial enterprises have virtually eliminated the smoke nuisance, so that "almost no black and yellow smoke belches from their chimneys." [48] A 1974 broadcast from Shenyang, however, compares 1974 with 1972 and reports that during this period "the volume of dust precipitation was reduced by 25 percent, while the monthly volume of dust precipitation in some industrial areas of the city was cut by 33 percent." [49] Nevertheless, visitors to Shenyang in 1974 still comment on the terrible air pollution in the city. Other cities, such as Harbin, where coal dust, smoke and soot have been a perennial problem, also report that the emission of smoke from smokestacks is now under control.[50] A more realistic evaluation would probably be that improvement has been made and that efforts to control air pollution will continue.

In general, the enterprises that recognize economic benefit from the elimination and recycling of gases and smoke probably are more successful in implementing the policy against air pollution. For example, the Chinese claim that "over 100 chemical materials are now recovered from coke oven gas alone." [51] The Chiaotou thermal power plant re-

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[45] NCNA, Sept. 14, 1972.
[46] *Wen-hui Pao (Wen-hui Daily)*, Sept. 22, 1972; in FBIS, Sept. 27, 1972.
[47] NCNA, May 10, 1972.
[48] NCNA, Oct. 28, 1972.
[49] NCNA, June 14, 1974.
[50] NCNA, July 23, 1972.
[51] *CR*, May 1971.

portedly "made use of smoke dust to produce temperature-preserving foam bricks valued so far at 180,000 *yuan*." [52] Despite the common belief that "you cannot have chemical works without smells any more than a fish market that does not stink of fish," the Liaoyuàn Chemical Plant in Shanghai apparently managed to eliminate all the odors. Among their many achievements the workers of the plant now manage to recover 250 tons of polyvinyl chloride resin a year from carcinogenic vinyl chloride gas that used to be discharged into the air.[53] The "reliance on the masses" is always a dominant theme and whenever possible there is also a jab at the foreign methods which require a lot of money. An oil refinery, for example, relied on a handful of people to get rid of the gaseous tungstic acid that polluted the atmosphere. Nothing was accomplished because these specialists "worked behind closed doors, thinking big and copying foreign methods." After the Cultural Revolution, however, teams of workers, technicians and leading cadres "without asking for investment from the state" managed to build effective recovery equipment, eliminated pollution and are now recovering more than 3 million yuan worth of liquid tungstic acid for the state every year.[54]

Finally, a personal note relating to air pollution in China. In the summer of 1973, as a member of the American Medical delegation, I visited the Institute of Hygiene in Peking. This institute functions under the Chinese Academy of Medical Sciences and is responsible for research and the setting of standards relating to industrial hygiene, working conditions and environmental health. The leading cadres told us in some detail of their work at the institute and of the efforts to improve air quality throughout China. The implementation of the standards, incidentally, is not connected to the institute, but is the responsibility of provincial health bureaus. A few days later, while visiting China's largest iron and steel works (in Anshan, Liaoning Province), the smoke was so heavy that visibility was limited to no more than a couple hundred yards. I attempted to inqure about the air pollution and what was being done about it. No one seemed to know what I was talking about and, of course, no one had heard of the Institute of Hygiene nor of any prescribed standards. Perhaps an exception; perhaps I spoke to the wrong people; perhaps things are better now. But that was my experience in the summer of 1973.

Water

The pollution of rivers and streams has a much more direct and immediate effect than does air pollution on the health of the people, on the local economy and on the environment. It is therefore not surprising that water pollution was an early concern of the authorities—albeit mostly the health authorities. In the early 1950's, however, the pollution of water by industries was not yet the problem it was to become and (as discussed in an earlier section) most of the effort was directed at controlling human waste and installing equipment for the filtration and disinfection of drinking water to eliminate the large-scale water-borne diseases then so prevalent in China. This primary goal basically has been achieved. Urban sewage seems to be well-

[52] NCNA, Dec. 5, 1973.
[53] *CR*, June 1972.
[54] *PR*, No. 45, Nov. 8, 1974.

managed: through expanded waterworks and controlled waterwells, safe drinking water is available to the great majority of the Chinese people.[55] Urban sewage is still mentioned, however, among the three categories of water pollutants currently listed by the Chinese: "industrial waste and sewage from cities; agricultural pesticides washed into the river by rain; harmful materials from mines and rocks which are dissolved by water and washed into the river." [56] Of these, industrial waste currently is cited as the most harmful.

Since the early concern about water pollution was entirely health-related, the Ministry of Health and the local public health personnel had the basic responsibility for combatting it. They exercised considerable clout in attacking the basic problems of health and sanitation, but when they had to tangle with industries which polluted rivers and streams they had a much more difficult time. Enterprises producing economic wealth were not very likely to treat seriously the "trivial" complaints of health personnel and probably only the most obvious and serious instances of water pollution were corrected. Although some initial progress was made during the 1960's, statements since the Cultural Revolution make it clear that there is considerable dissatisfaction with what has been accomplished so far. As is their custom, the Chinese attempt to soften criticism by including it in reports of accomplishment. Nevertheless, the complaints are there, loud and clear, and the following letter in the People's Daily is not unusual:

> * * * we notice that some industrial plants and enterprises situated along the rivers have failed to pay sufficient attention to [the protection of inland waterways]. Some industrial plants have seen fit to dump their cinder and other industrial waste into the rivers, and others have arbitrarily filled in portions of the rivers to expand their land. * * *[57]

Since 1970, however, the success stories have far outnumbered the complaints and their number has been growing rapidly. One success story that received considerable publicity in China is the Nun-chiang, a river in Heilungkiang on which Tsitsihar—an industrial city with more than 1 million inhabitants—is situated. With the construction of numerous industries in the city, some 250,000 tons of water was being dumped daily into the once clean river, killing off most of the fish and reducing the catch in 1969 to about one-fifth of what it had been in 1960. After identifying the problem and discussing possible solutions with the masses, a program was approved requiring individual enterprises to recover the harmful substances in their industry's waste water, to make comprehensive use of these substances and then to divert the waste water to a reservoir for eventual use in irrigating fields. Between June and November 1970, more than 5,000 workers, peasants, Liberation Army soldiers, Red Guards and city inhabitants took part daily in the project: waste waters were diverted away from the river, via a 6-kilometer-long channel, into a newly built reservoir with a capacity of 20 million cubic meters. It was a big undertaking and apparently it produced big results. Among the various materials recovered from the waste waters were cadmium, oils, acids, alkali, paper pulp, and silver; the oxygen content of the water was raised and fish returned to the

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[55] As early as 1959 it was reported that most cities use the chlorine-ammonia sterilization method and that continuous testing and analysis is performed to assure the water is safe. (*JMPC*, vol. 1, No. 10, October 1959; in *JPRS*, No. 2745, June 10, 1960.)

[56] *K'o-hsueh Shih-yen (Scientific Experiment)*, No. 2, February 1974; in *JPRS*, No. 62,812, Sept. 26, 1974.

[57] *JMJP*, Aug. 8, 1973; in FBIS, Sept. 7, 1973.

Nun-chiang; and fields irrigated by waste water produced greater yields than ever before.[58] Since the Nun-shiang runs through a relatively remote area with low-population density, and since Tsitsihar is the only large city along its banks, the fairy tale success story described above is very believable. The problems are naturally much more difficult in the densely populated and much more industrialized regions of China. Despite reported successes, Shanghai's Whangpoo River, for example, is not likely to achieve any easy triumph over her capitalist counterparts.

It is quite evident that during the past few years the regime has begun pressuring the industrial enterprises which are polluting waters. As in the case of air pollution, the greatest progress so far has been made by those enterprises which are able to transform liquid industrial waste into "treasure"—those that can get some capital return on their investment to process the waste waters. A chemical plant in Pang-fou (Anhwei Province) used to dump the waste liquid from its saccharine production into the Huai River, but is now treating it and recovering large volumes of methyl alcohol, fat and copper sulfate.[59] The Changchun Film Studio is now recovering large amounts of silver from water previously discharged into a river.[60] Detailed instructions are disseminated for the recovery and recycling of mercury-containing liquid wastes which are so harmful to the environment.[61] These and scores of other examples testify to the widespread activities aimed at controlling water pollution; they also illustrate how little was done in the past and how much more there is to do.[62]

Solid Waste

Whereas the first two of the "three wastes"—waste gas and waste water—combine envronmental and economic considerations, the third—slag and other waste materials—is almost entirely based on the call for economic fraguality and the need to "turn wastes into treasures"; the emphasis in the first two cases is on prevention, and in the third, on utilization. The recurring mass cleanup campaigns, initiated soon after the Communist regime came into power, also collected waste that was sometimes recycled. The difference between those campaigns and the current drive is not only intensity, but the fact that, once again, primary responsibility is being placed in the enterprises themselves. In other words, most of the collection and much of the recycling is done by those who originate the waste.

An important aspect in the present effort not to waste waste, is the involvement of the commercial departments throughout China which have "actively gone to factories and countryside to tap latent potentials in purchasing cast-off materials."[63] The key word here is "purchas-

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[58] *Ching-chi Tao-pao (Economic Bulletin)*, Hong Kong, Aug. 30, 1972; in *JPRS*, No. 57.290, Oct. 18, 1972.

[59] *Ta-kung Pao (Impartial Daily)*, May 11, 1972; in *JPRS*, No. 56.741, Aug. 10, 1972.

[60] *PR*, No. 39, Sept. 27, 1974.

[61] *Hua-hsueh T'ung-pao (Chemical Bulletin)*, No. 1, Jan. 23, 1974; in *JPRS*, No. 62,812, Sept. 26, 1974.

[62] Although in the past China completely ignored ocean pollution as an issue (as did most other nations), whether because of real concern or for still another opportunity to get at the superpowers and other western nations, at the "Law of the Seas" conference in Caracas (Venezuela) in the summer of 1974, she strongly supported measures to protect the marine environment. The New China News Agency also gave considerable space to third world spokesmen at the conference who expressed fear of the damage done to beaches, fishing and marine environment in general, by pollution through both apathy and accident.

[63] NCNA, Nov. 17, 1970.

ing," which provides considerable incentive for capital-short industrial enterprises and even residential neighborhoods to cooperate in this endeavor. Some of the urban neighborhoods have established "purchase posts" and there are reports of so-called "economy boxes" put up in villages to collect reusable waste, simplifying the work of purchasing agents who must cover large rural areas. Apparently many of the commercial bureaus now have a "junk purchasing department" which not only collects and purchases various types of industrial waste, but whose members actually go to the factories to explain to the leadership and the workers how waste should be recovered and managed and how it might be utilized. They then go on to sort and process much of it. The workers and staff members of a commercial organization in a *hsien* in Hopei Province 'made use of the waste and used materials to repair and process 520,000 small farm tools." [64] They must have been small indeed, but the activity is more important than size or numbers. There is even a report of an "oil refinery under [the direction of a] waste material company" of a district in Shanghai that succeeded in extracting enough fat from waste to produce 1.7 million cakes of soap.[65]

The importance of the commercial departments in the recovery and use of waste may be seen from their accomplishments in 1972. They recovered more than 5 million tons of waste and used materials worth 830 million yuan, including "2,650,000 tons of scrap iron, more than 20,000 tons of copper, 760,000 tons of raw materials for making paper, 180,000 tons of bones of various kinds, and 120,000 tons of used rubber." [66]

The impressive figures quoted above represent, however, only a part of the total effort. Factories, enterprises, government organs, schools, and the masses in general are also involved, either as part of their daily routine or through the participation in special collection drives. All the large cities report such drives—some organized by an individual enterprise for its own use and others organized by revolutionary committees and involving larger segments of the population. Once again examples abound and only a few are selected by way of illustration. In just 3 days a drive in Shenyang (Liaoning Province) "recovered 101,000 tons of scrap iron and steel, of which 4,000 tons were delivered to the state." [67] During one of these days—a Sunday when all the offices were closed—3,000 cadres from the municipal revolutionary committee and municipal departments took part in the drive. There are numerous reports of the production of building materials from waste, such as the 20,000 tons of cement made from waste in Tientsin,[68] or the "over 2 million tons of building materials made by utilizing waste refuse" in Shanghai.[69]

There are also many examples of enterprises responding to the call to "take one trade in the main and run various undertakings." By utilizing waste glass fibers accumulated during the past 10 years, a glass fiber plant in Kiangsi Province turned out over 1,300 tons of glass fiber products, thereby "initially solving the pollution problem and creating a large sum of wealth for the state." [70] A chemical plant

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[64] *JMJP*, Jan. 31, 1973.
[65] NCNA, Nov. 17, 1970.
[66] *JMJP*, Jan. 31, 1973.
[67] NCNA, June 3, 1971.
[68] NCNA, Apr. 22, 1971.
[69] *Ching-chi Tao-pao* (*Economic Bulletin*), Hong Kong, Nov. 1, 1971; in *JPRS*, No. 55,245, Feb. 22, 1972.
[70] *Ching-chi Tao-pao* (*Economic Bulletin*), Hong Kong, June 28, 1972.

in Chekiang Province constructed a "small-scale iron and steel mill" to utilize some 300 tons of iron pyrite cinder discharged daily from the sulfuric acid-making process, while the slag from the iron and steel mill is now being used to make cement, and the iron cinder, coal and carbide slag are turned over to building construction units to make bricks and tiles.[71] This type of arrangement is not unusual. There are large plants operating one or more small plants for processing their waste materials, or several large plants operating one small plant for this purpose. Equipment of these small plants is old—previously discarded or unused, often turned over by large plants that have been rebuilt. Most of the small plant workers are dependents of workers employed at the large plants or residents of the neighborhood. It is reported that in the city of Cheng-chou (Honan Province) more than 140 large-sized enterprises, to make full use of their waste liquid, gas and residue, are operating more than 200 small industrial plants which are producing more than 600 different products, including chemical and industrial raw materials such as iron and copper sulfate, sodium sulfate, silver, rolled steel, steel ingots, lead ingots, etc.[72] Seem a little far-fetched? Perhaps, but maybe it is only a problem of terminology and quantity.

Policies and Determinants

It is customary in a report such as this one to start by discussing policies and then to review their implementation and related activities. When writing about the People's Republic of China, however, it often seems more appropriate to reverse this sequence and the subjects of environment and pollution are cases in point. For almost 20 years China did not have a policy aimed at protecting the environment—she was much too preoccupied first with survival and later with the basic goals of economic development. But although ecological considerations probably never even crossed the minds of the Chinese leaders in those early years, in retrospect, many of the policies pursued by the People's Republic had a very fundamental impact on the country's human and natural environment. The two most basic of these policy goals focused on the improvement of the health of the people and the improvement of the land in order to increase food production. Since environment can be defined as "the aggregate of social and cultural conditions that influence the life of an individual or community," the improved health and nutrition of the population naturally improved the environment. That is why Peking can now piously proclaim that "Chairman Mao and the Party Central Committee have always paid attention to environmental problems." [73] The hindsight aspect of this and similar statements in no way detracts from China's past and present accomplishments in programs that have improved the environment, but it is important to place them in proper perspective. China did not "invent" environmental concern any more than she "invented," for example, women's rights—an erroneous impression easily gotten from some of Peking's verbiage and from some of the more enthusiastic China boosters.

Actually, it was not until after the Cultural Revolution (circa 1970) that China initiated serious pollution control measures that were con-

[71] *Wen-hui Pao (Wen-hui Daily)*, Hong Kong, Apr. 21, 1972.
[72] *Chung-kuo Hsin-wen (China News)*, Nov. 9, 1970; in *JPRS*, No. 52,527, Mar. 3, 1971.
[73] *PR*, No. 45, Nov. 8, 1974.

sciously an outgrowth of concern for the environment. Considering the improvement in the health and welfare of the Chinese population, even before the Cultural Revolution, this may appear to be a picayune distinction. It is, however, an important conceptual shift and one that the Chinese themselves recognize. Not that the People's Congress passed some law (similar to the National Environment Policy Act passed by the U.S. Congress in 1969)—this is not the way things happen in the People's Republic. Undoubtedly directives were issued and channeled down through the appropriate institutions, but to the outsider, the only indication that a new policy was being implemented comes from articles in major Party publications such as the *People's Daily* and the *Red Flag*. In the early 1970's, such articles talked about "embarking on work to prevent and eliminate environmental pollution" and about the "developing mass movement," also admitting that such a movement was not possible before the Cultural Revolution, when Liu Shao-chi's counterrevolutionary, revisionist line was dominant. These and other statements confirm that the antipollution activities in the 1950's and 1960's were quite spotty and in no way comparable to the current drive.

As usual, it is unfair to blame Liu Shao-chi for the early lack of antipollution measures. And there are good reasons why pollution became an important domestic issue only in the last few years. By 1970 China's basic priorities were more or less under control and she could concentrate on some important refinements. At the same time, because of industrial growth in the cities and the construction of small- and medium-sized industries in rural areas where haphazard waste disposal could and did adversely affect agricultural production, there were increasing pressures to check pollution. International concern was peaking in anticipation of the Stockholm Conference on Human Environment: Peking was not about to pass up the opportunity to revile the "capitalists" and "revisionists" for failing to deal with severe environmental problems and, at the same time, make points with the newly developing countries. This meant that domestic measures had to become more rigorous and more visible. Finally, it is doubtful if the antipollution drive would have been mounted with the same intensity if its mainspring were not essentially economic—if it were not so closely integrated with the mass movement to eliminate waste and to recycle everything that was recyclable. This is not to say that concern for the "quality of life" was not also a motivating factor. A better environment improves people's health which makes them more productive which improves their standard of living. The quality of life is a long-range goal that can be achieved only through better health and sanitation and increased productivity. It is therefore quite reasonable that in pursuing a better environment, Peking's priorities would be focused primarily on productivity and resource conservation, rather than on pollution per se. That is why policy statements printed in national publications and reprinted for international consumption will usually mention that the elimination of three wastes (air, water and solid pollutants) will "help raise the level of the people's health" (which it will), while at the working level and in reports by specific enterprises, the health aspect is subordinated and most of the emphasis is placed on "promoting the development of the national economy."

The "turning waste into treasure" approach is also the most effective way of motivating the managers of production. China's industrial production still depends on profit and loss accounting, and a manager of an enterprise will probably not remain in his position if he cannot show a profit at the end of the year. He tends to resist new demands that disturb his cost-benefit balance. In 1971, for example, the *People's Daily* complained that:

Some comrades still hold the view that the primary task, the compulsory task, is to fulfill the production plan for the main items. * * * They talk about eliminating the three harms [harm to people's health, to industrial production and to agricultural production] year after year but never produce any results because they consider any waste product that is of low economic value as unprofitable and not worth recovering.[74]

Where factory leadership felt that way it was warned that if it is "concerned only with petty profits and ignores the major issues * * * [it] must have been poisoned by Liu Shao-chi's theory of putting profits in command." What is interesting is that to counteract this erroneous attitude, the articles argued on the same terms that it decried, pointing out that waste can, in fact, be profitable and that the "utilization of the three wastes can promote the development of production rather than hamper it."

Almost 2 years later, an article in the June 16, 1973, issue of the *People's Daily*[75] discussed the interrelationship between environmental protection and economic development and, to solicit support from the industrial cadres, it again emphasized the damage which industrial waste might cause to production and the economy. It pointed out that since "pollution of the environment is rapid whereas its elimination takes a longer time," preventive measures are essential. At the same time the article had this warning to anyone who might favor a slower development of industry to minimize pollution problems: "* * * we can only solve the problem of environmental protection by developing the economy, and not seek a good environment by slowing down economic development or by other negative methods." Although the logic is rather curious, the meaning is clear. The manager of a steel works would not be required to close the blast furnaces just because they are seriously polluting the environment. Given China's economic posture, such a step obviously would be absurd.

There is another factor to be considered in discussing the determinants of pollution control—that of population. Although the threat to world environment derives almost exclusively from the presence of man, and there is a natural and obvious correlation between numbers of people and pollution in its broadest sense, the Chinese refuse to acknowledge this relationship except in an indirect way. China's basic philosophy with regard to population was repeated (in only slightly modified terms) at the Stockholm Conference, namely: "Since of all things in the world people are the most precious, it is wholly groundless to think that population growth in itself will bring about pollution and damage of the environment and give rise to poverty and backwardness."[76] To reinforce this point Tang Ke, the chief spokesman at Stockholm, went on to note that the population of the People's Republic of China increased by some 200 million between 1949

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[74] NCNA, Sept. 6, 1971.
[75] *PR*, No. 29, July 20, 1973.
[76] *PR*, No. 24, June 16, 1972.

and 1970 but "because we had driven out the imperialist plunderers and overthrown the system of exploitation" the living standard of the people and the living environment have improved. In other words, it is not the number of people, but the political system under which they live that is significant.

There is no doubt about the improved living standard of the Chinese population, but behind all the bravado there is a very clear official understanding that a smaller population growing at say 10 million rather than 15 million per year would not only ease the economic burdens, but would also be less damaging to the nation's environment. Certainly China's all-out effort to reduce population growth [77] would suggest a more conventional view of the cause-and-effect relationships among population size, economic and social development and the consequent problems of pollution.

The only departure from the "people are precious" line is with regard to urban concentrations—when the density of population becomes a factor. City people are still "precious," but they do create more pollution problems than their country cousins. Controlling urban growth has been a fairly consistent policy started soon after the establishment of the People's Republic, and although it has had its literal and figurative ups and downs, Peking has been quite successful in limiting city population.[78] Economic, social, and political considerations predominated in establishing controls over "blind infiltration" of peasants into the cities, but even in the 1950's some mention was made of related environmental problems, including industrial pollution. But since China could not very well afford to shut down operating plants, the reports of factories being moved from some of the larger cities probably referred only to obsolete enterprises that could no longer produce with even limited efficiency. This was also in line with the general policy of concentrating much of the new development in industrial zones on the outskirts of cities, where new housing could be built and where pollution problems could potentially be handled with greater ease.

By the 1960's, at least four other considerations provided the impetus for industrial (and, therefore, population) dispersal. The first stemmed from increasing tensions between China and the Soviet Union and China's desire to decrease industrial vulnerability in case of a war. The second was to devise a way of economically absorbing the millions of youth who enter the working ages every year. The third was to encourage local self-sufficiency in the basic needs of agriculture. And the fourth was to develop the backward areas and to raise the living standard of people who lived there. These were the primary reasons why China implemented a program of building small industries in rural areas. Initially, this policy was completely independent of environmental considerations, but since the Cultural Revolution the call for the "rational distribution of industries" and for limiting urban growth has been blended with the need for pollution control. Again in retrospect the Chinese say that the building of many small towns was an effective way of protecting the environment: "Small towns * * * make life more convenient to the people and facilitate environmental

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[77] For a detailed discussion of China current population policies, see: Leo A. Orleans, *China's Experience in Population Control: The Elusive Model*, report for the Committee on Foreign Affairs, U.S. House of Representatives, September 1974.

[78] For a discussion of urban policies, problems and numbers, see: Leo A. Orleans, *Every Fifth Child: The Population of China* (Stanford University Press, 1972), ch. V.

protection. Small in area and population, these towns make for easier disposal of industrial and household refuse." [79] They even quote Engel to the effect that "only through the blending of cities and villages can the present air, water, and land pollution be ruled out." [80] No one can argue with the contention that it is easier to handle pollution in smaller towns with a smaller population, but at the same time it does substantiate the obvious: The greater the density of "precious people," the greater the damage to the environment—even in China.

Although the factors discussed above continue to underlie present environmental policies, and pollution control is still to a large extent a stepchild of economic development, some changes may be in prospect. Perhaps China's participation at the Stockholm Conference in 1972 and her subsequent agreement to contribute about $250,000 to the United Nations Environment Program have inspired Peking to initiate some more stringent measures; perhaps the complaints about progress in pollution control (disguised only by their location in the middle paragraphs of articles which claim significant advances) have convinced the authorities that the responsibility for environmental protection must be divorced from the responsibility for economic production. At any rate, in mid-1974, Peking created the Office of Environmental Protection and placed it directly under the State Council.[81]

As of this writing nothing is known about this organization, but what other purpose could it have except to plan and unify an environmental protection program? If it is patterned after China's similar national organizations, it will have parallel offices in all the provinces and municipalities of the country. There have already been references to regional organizations, such as the Tsinghai Provincial Environmental Protection Commission and the Kirin Municipal Environmental Protection Office, which by now, along with perhaps 40 or 50 other such branch offices, should be standardized and subordinated to the National Office of Environmental Protection. Uncoordinated conferences concerned with various environmental problems, formerly held by municipal revolutionary committees, by industrial ministries, by health and other organization, in the future will, presumably, be coordinated by the new Office in Peking and its branches. This office should also coordinate some of the activities of the Ministry of Agriculture, the Ministry of Public Health and the Ministry of Transportation—all of which will probably continue to hold on to many environment-related responsibilities within their general purview. It is, of course, not known what, if any, enforcement authority has been granted the Office of Environmental Protection, but potentially an independent organization could certainly be much more effective in enforcing environmental standards than, say, a self-monitoring industrial ministry whose main concern is meeting production quotas.

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[79] *PR*, No. 45, Nov. 8, 1974.
[80] *Kuang-ming Jih-pao* (*Kuang-ming Daily*), Nov. 4, 1973; *in Survey of China Mainland Press*, No. 5499, Nov. 20, 1973.
[81] *Christian Science Monitor*, Oct. 22, 1974, p. 5.

Although the creation of a new government agency presupposes a growing attention to environmental problems, the question still to be answered is: Will industries have to continue to be "self-reliant" in combating pollution, or will additional incentives be provided through some form of state subsidies? As in other areas, China until now has been "walking on two legs"—attempting to use both modern and traditional methods to fight pollution. From a technological viewpoint, China has the know-how for most of the modern techniques of water treatment and is capable of producing mechanical collectors, wet scrubbers, and electrostatic precipitators to control air pollution. This she has been doing on a very selective basis. Following the pattern in other technical fields, a great deal of encouragement in pollution control has been given to worker innovation and to the adaption of indigenous Chinese methods, rather than "seeking after big and foreign things." This, of course, is a more frugal approach but some significant innovations have been reported by Peking—albeit mostly by individual enterprises, to combat specific problems and using their own resources. At the same time, the regime now calls on scientific research organs, designing departments, health organizations, institutes of higher learning, and other units to cooperate with each other in eliminating the "three wastes" and "to combine the revolutionary spirit with a scientific approach." [82] It seems quite possible, therefore, that the emphasis on science and technology might result in the establishment of a new national research institute specifically for environmental protection.

If the foregoing discussion of China's environmental policies and programs appears a little cynical in spots, it is only in contrast to the often exaggerated accomplishments claimed by Peking, especially when addressing an international audience. By placing under the umbrella name of "environment" a great variety of programs pursued for the past 25 years, China can now sneer at the bumbling and stumbling efforts of industrialized nations to correct conditions stemming from decades of environmental neglect. But to question the image China is attempting to project is not to belittle her successes. She may not have found all the solutions to human and industrial pollution, but because of considerable wisdom and a measure of "luck," she does have much to be proud of.

China has been wise because very early on Mao Tse-tung recognized that the long-term success of economic development required that the people be protected from the hazards of environment and that the environment be protected from uncontrolled abuse. This resolve was based on very practical rather than strictly ecological considerations—long before the limited fad for ecology grew into a major international concern. Mao firmly believed that the basic physical needs of the population—good health, good water, adequate food—were prerequisites to any and all other national goals, hence, the early policies to improve sanitation and health and to make the land more productive. Only after these needs were largely achieved could environmental concern turn to some of the important, but relatively less pressing, problems stemming from industrial pollution.

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[82] *Hung-ch'i (Red Flag)*, No. 12, Dec. 1, 1973; in *Survey of China Mainland Magazines*, Dec. 17–28, 1973.

"Luck" becomes a factor only at the implementation stage of some of the progress. China is "lucky" that more than four-fifths of her population is located in rural areas, where lower densities and essentially agricultural pursuits make environmental problems easier to manage. She is "lucky" that she does not have an economy of abundance which is so damaging to the environment, but rather an economy of frugality in which the "do not waste" ethic is relatively easy to enforce since, of necessity, it is inherent in the society. China is "lucky" that her industrial pollution problems are nowhere as serious as those of highly industrialized, highly urbanized countries, and "lucky" that she can take advantage (even if surreptitiously) of the experience and technical and scientific know-how of those countries in selecting priorities and measures most suitable to China's needs and economic capabilities.

There is no such thing as a safe prediction for China, but it does seem that because of this combination of wisdom and "luck" China will not experience the type of environmental degradation that is now present in most of the world's industrial nations. At present the problems are still numerous and nowhere near to being solved, but perhaps the peak has been reached and problems of environment and pollution will take a gradual downturn. The mass drive started in the early 1970's will probably have relatively limited immediate benefit, but it is an important educational effort, making both the workers and the cadres conscious of the economic and health consequences of uncontrolled pollution. In a sense, it establishes a foundation for future policies which undoubtedly will place major emphasis on "prevention" that can be implemented as the economy is developed, rather than on the more difficult "cure" for existing pollution problems. Economic development will continue to be a major consideration in the management of environment, but this should not be interpreted as a negation of some of China's more idealistic motives, because a higher standard of living for the "poor and blank" people can come about only as a result of economic progress.

In his 1970 "Message on Environment" delivered to Congress, President Nixon stated that:

> The task of cleaning up our environment calls for a total mobilization by all of us. It involves governments at every level; it requires the help of every citizen. It cannot be a matter of simply sitting back and blaming someone else.

Total mobilization is indeed a vital prerequisite. In the United States, however, it is only an abstract rallying call; in the People's Republic of China it is the key to virtually every major accomplishment. China's industrial pollution may not respond to faith healing, but if Peking is serious about the commitment to environmental improvement (as the creation of the Office of Environmental Protection would indicate), there is no reason why appropriate fund allocations and total mobilization of the masses should not produce significant results.

Part II. URBAN AND INDUSTRIAL DEVELOPMENT

CIVILIAN INDUSTRIAL PRODUCTION IN THE PEOPLE'S REPUBLIC OF CHINA: 1949–74

By ROBERT MICHAEL FIELD

I. INTRODUCTION

The index of industrial production for the People's Republic of China presented in this paper is a substantial revision of the index I prepared for the Joint Economic Committee in 1966 [1] and brought up to date in 1971.[2] The three principal changes are as follows:

First, the number of commodities included in the index for the years since 1957 has been increased from 11 to 27. Although the Chinese have not resumed the systematic release of economic data, they have published or broadcast an increasing amount of information in the last 3 or 4 years. This information has made it possible to estimate the output of a larger number of commodities.[3] In particular, coverage of the machine-building industry has improved enough to permit the calculation of a separate machinery index. While the increased coverage strengthens the index, it is well to bear in mind that the number of series is only about one-tenth of the number included in an index of Soviet industrial production prepared for the Joint Economic Committee in 1973.[4]

Second, the use of a new index number technique has made it possible to include physical output series for which the data are not complete.[5] Because the coverage of the physical output data after 1957 is much worse than it is for the years 1949–57, the index for the years since 1957 had previously been calculated by the Kaplan-Moorsteen method.[6] A shortcoming of the Kaplan-Moorsteen method is that it does not use series for which data are available only sporadically, such as the Chinese series for electric generators (which is available for 1949–58, 1964–65, and 1972) or silk cloth (which is available for 1949–59, 1962–63, and 1974). With the new method, all available information is used in the index.

And third, the index has been restructured to facilitate comparison with a reconstruction of the official index of industrial output. The version of the index that I published in 1972 was divided into the categories of fuels, industrial materials, machinery, and light indus-

[1] Robert Michael Field, "Chinese Communist Industrial Production," *An Economic Profile of Mainland China*, Joint Economic Committee of the U.S. Congress, Washington, D.C., 1967, pp. 269–295.

[2] Robert Michael Field, "Chinese Industrial Development: 1949–1970," *People's Republic of China: An Economic Assessment*, Joint Economic Committee of the U.S. Congress, Washington, D.C., 1972, pp. 61–85.

[3] The estimates are presented in tables B–1, B–2, and B–3.

[4] Rush V. Greenslade and Wade E. Robertson, "Industrial Production in the USSR," *Soviet Economic Prospects for the Seventies*, Joint Economic Committee of the U.S. Congress, Washington, D.C., 1973, pp. 270–282.

[5] For a description of the technique, see appendix C.

[6] Norman M. Kaplan and Richard H. Moorsteen, *Indexes of Soviet Industrial Output*, Santa Monica, 1960, pp. 61–68.

try. Because there were no official data with which to compare these categories, their precise coverage was not important. Since then, scattered data on the gross value of industrial output for individual provinces have been compiled and used to reconstruct the gross value of industrial output for the country as a whole during the 1960's and 1970's,[7] and the total has been divided into producer and consumer goods for at least some recent years.[8] Thus, I have switched to the categories of machinery, other producer goods and consumer goods in order to bring the structure of my index more closely into line with that of the official index.

The official index and my index both attempt to measure changes over time in the real output of factories, mines, and public utilities, and both use the same broad categories. There are, however, important differences between them. First, there are differences in coverage. The official index includes the production of military hardware and the repair of machinery and equipment, neither of which are in my index. Second, there are differences in concept. The official index is derived from data on the gross value of industrial output. The official gross value data is generally considered to be methodologically deficient because it is collected by the "factory reporting method." Under this system, each enterprise reports the gross value of its output in constant prices, net of intraenterprise transfers. Because deductions are not made for semifinished inputs purchased from other enterprises, changes in the degree of vertical integration affect the reported level of output independently from changes in the real level of production.

My index is an approximation of the value added in industry. Different types of weights had to be applied to different parts of the index because data are not available in sufficient detail to calculate true value-added weights. The relative shares of the wage bill paid to workers in 1956 are used as the best approximation of value added for industry excluding handicrafts. Because neither value-added nor wage bill data are available for handicrafts, the official gross value data are used to weight the categories within handicrafts and to combine industry and handicrafts into the overall index.

What impact do these conceptual differences have on the measurement of industrial output? In the 1950's, when 1952 constant prices were used to compile the official data, the official indexes are higher than mine, branch by branch, and thus appear to have a consistent upward bias. In the 1960's and 1970's, when 1957 prices were used, the indexes are quite close. It was not possible to make the comparison in as great detail after 1957 because of the smaller number of commodities for which output could be estimated and of the lack of official indexes for individual branches of industry. I have tentatively concluded, however, that the current gross value indexes are a reasonable measure of output. The two indexes should be used together, the official index with complete coverage but methodological deficiencies and my index with restricted coverage but a methodology closer to the practice of Western countries.

In addition to keeping the index up to date, adding to the number of series, and improving the quality of the physical output estimates,

[7] Robert Michael Field, Nicholas R. Lardy, and John Philip Emerson, *A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–1973*, U.S. Department of Commerce, forthcoming.
[8] See table B–7.

three areas require further research. The first is military machine building. The evidence available to me suggests that military machine building is included both in the official gross value index and in the wage bill weights that I have used in my index. I characterized the previous versions of the index as total industrial production with military hardware implicitly assumed to have grown at the same rate as civilian output. The index of military procurement presented in this volume[9] shows that this assumption was reasonable through 1971. The decline in military procurement since 1971 makes it clear that the assumption is no longer valid. As a result, I have characterized this index as an index of civilian industrial output in which machine building is somewhat overweighted because the value of military hardware is included in the base year. Characterizing the index as civilian calls attention to but does not solve the problem. Either the weight assigned to machine building should be reduced to make it a true index of civilian industrial output or output series for military hardware should be included.

The second area requiring research is prices. Except for machine building, 1952 prices were used to calculate the branch of industry indexes, whereas the relative shares of the wage bill in 1956 were used to aggregate them into the index for total industrial production. Thus the weight base for the index is mixed. For the machine-building industry, prices have been estimated for 1957, 1965, and 1972 as well as for 1952.[10] When similar studies have been completed for other sectors of industry, the index should be calculated with 1957 prices throughout. And later, if enough information is made available on employment, the wage bill, or the gross value of output by branch of industry, the base of the index should be shifted to some more recent year.

The third area is the nature of the adjustment made in the official gross value data when the Chinese shifted from 1952 to 1957 constant prices. Beginning in 1958, the preliminary processing of agricultural products and the production of handicrafts by peasants for their own consumption were no longer treated as agricultural activities but were incorporated in the gross value of industrial output instead. The year 1957 is the only year for which industrial output was reported both in 1952 and in 1957 constant prices. The figures in 1957 prices have been universally assumed to be consistent with the figures in 1952 prices, and price indexes derived from them have been used to deflate data for later years.[11] It is possible, however, that the figures for 1957 in 1957

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[9] Sydney H. Jammes. *The Chinese Defense Burden, 1965–74*, a paper in this volume.

[10] CIA, *Prices of Machinery and Equipment in the People's Republic of China*, forthcoming.

[11] Industrial output in 1957 was 78.390 million yuan in 1957 prices and 70.400 million yuan in 1952 prices (see State Statistical Bureau. *Ten Great Years*, Peking, 1960, p. 87). The price index for 1957 derived from these figures is as follows:

$$\frac{\Sigma\ Q57\ P57}{\Sigma\ Q57\ P52} \times 100 = \frac{70.400}{78.390} \times 100 = 89.8$$

prices have been adjusted for coverage as well as for price and that they are consistent with the data in 1957 prices for 1958 and later years rather than with the data in 1952 prices for 1957 and earlier. Independently calculated prices indexes are needed to clarify the nature of the adjustment and thus of the relationship between the reconstructed official index and my index.

II. The Growth of Industrial Production

Industrial production in China, as measured by the indexes presented in table 1, grew at an average annual rate of 13 percent during the years 1949–74. The experience in the 1950's was quite different from that of the 1960's and 1970's. The average annual rate of growth during the period 1949–60 was 22 percent, whereas the rate for the period 1960–74 was only 6 percent. The rates of growth for these and other selected periods between 1949 and 1974 are presented in table 2.

TABLE 1.—INDEXES OF CHINESE INDUSTRIAL PRODUCTION, 1949–74

	Field					Official		
		Producer goods						
	Total	Total	Machinery	Other	Consumer goods	Total	Producer goods	Consumer goods
1949	20	14	8	15	28	18	10	25
1950	27	21	14	22	36	24	15	33
1951	38	30	24	31	48	34	22	44
1952	48	39	33	41	60	44	32	55
1953	61	51	50	51	73	57	44	69
1954	70	62	60	62	82	66	53	79
1955	73	66	62	67	81	70	60	79
1956	88	84	90	83	94	90	84	95
1957	100	100	100	100	100	100	100	100
1958	145	166	175	164	117	167	203	133
1959	177	212	242	205	131	232		
1960	184	237	274	228	114			
1961	108	129	116	132	80			
1962	114	138	140	137	83			
1963	137	158	178	153	109			
1964	163	183	213	177	135	163		
1965	199	212	263	200	183	195	214	178
1966	231	250	326	232	205	235		
1967	202	207	273	192	195			
1968	222	228	292	213	214	203		
1969	265	289	455	249	233	267		
1970	313	345	573	292	271	328	377	283
1971	341	395	645	336	270	376		
1972	371	428	677	370	294	408	522	301
1973	416	478	754	414	332	449	574	331
1974	432			429	341	471	600	350

Sources: Field: App. A. Official: table B-7

TABLE 2.—AVERAGE ANNUAL RATES OF GROWTH FOR CHINESE INDUSTRIAL PRODUCTION, SELECTED YEARS, 1949–74

	1949	1952	1957	1960	1961	1965	1966	1967	1970	1973
Total:										
1952	34									
1957	22	16								
1960	22	18	23							
1961	15	9	2	−41						
1965	15	12	9	2	17					
1966	15	12	10	4	16	16				
1967	14	10	7	1	11	1	−12			
1970	14	11	9	5	13	9	8	16		
1973	13	11	9	6	12	10	9	13	10	
1974	13	11	9	6	11	9	8	11	8	4
Producer goods:										
1952	41									
1957	28	21								
1960	29	25	33							
1961	20	14	7	−46						
1965	19	14	10	−2	13					
1966	18	14	11	1	14	18				
1967	16	12	8	−2	8	−1	−17			
1970	17	13	10	4	12	10	8	19		
1973	16	13	10	6	12	11	10	15	11	
Machinery:										
1952	58									
1957	36	25								
1960	37	30	40							
1961	24	15	4	−58						
1965	24	17	13	−1	23					
1966	24	18	14	3	23	24				
1967	21	15	11	[1]	15	2	−16			
1970	22	17	14	8	19	17	15	28		
1973	21	16	13	8	17	14	13	18	10	
Other producer goods:										
1952	38									
1957	26	20								
1960	28	24	32							
1961	20	14	7	−42						
1965	17	13	9	−3	11					
1966	17	13	10	[1]	12	16				
1967	15	11	7	−2	6	−2	−17			
1970	15	12	9	3	9	8	6	15		
1973	15	12	9	5	10	10	9	14	12	
1974	14	11	9	5	10	9	8	12	10	4
Consumer goods:										
1952	29									
1957	17	11								
1960	14	8	4							
1961	9	3	−5	−30						
1965	12	9	8	10	23					
1966	12	9	8	10	21	12				
1967	11	8	7	8	16	3	−5			
1970	11	9	8	9	14	8	7	12		
1973	11	9	8	9	13	8	7	9	7	
1974	11	8	7	8	12	7	7	8	6	3

[1] Negligible.

A. Economic Rehabilitation, 1949–52

During the period of economic rehabilitation, the index shows that industrial production more than doubled, growing at an average annual rate of 34 percent. This rapid rate of growth was characterized by large increases in employment, with little or no growth in the net value of fixed capital assets. The capacity damaged by the war or lost through the Soviet removal of equipment from Manchuria in 1945 was repaired or replaced and put back into operation, and supplies of raw materials were improved.

B. The First Five-Year Plan, 1953–57

During the First Five-Year Plan period, industrial production doubled again, reaching a level five times that of 1949, but the rate of growth was slower and less steady than it had been during the period of economic rehabilitation. Different factors determined the pattern of growth in the two periods: the relative rates of growth during the period of rehabilitation reflect the extent to which war damage had been repaired, whereas the patern of growth during the First Five-Year Plan period was determined by the decisions on investment policy made by the new government.

C. The Leap Forward, 1958–60

In 1958, after the successful completion of the First Five-Year Plan, orderly industrial development was abandoned and the Leap Forward inaugurated. It quickly proved to be an ill-conceived attempt to speed up the rate of growth by letting "politics take command" and by driving men and machines at a pace that could not be maintained. The rate of growth, which had surged to 45 percent in 1958, dropped to 22 percent in 1959, and was only 4 percent in 1960 as the Leap Forward began to collapse.

Most of the growth in industrial production during the years 1958–60 would have occurred even without a Leap Forward. The acceleration of the existing industrial construction program during 1958 and 1959 resulted in large additions to capacity. For example, of the 921 major industrial construction projects started during the First Five-Year Plan period, 428 were completed and operating normally by the end of 1957, and 109 were in partial operation. But in 1958 alone, many new construction projects were started, and 500 were completed. Merely putting these new plants into operation would have been enough to guarantee China substantial gains in industrial production. Thus the political excesses of the period masked what was a truly substantial achievement in expanding industrial capacity.

D. Recovery and Readjustment, 1961–66

In 1961, industrial production fell sharply to a level slightly above that of 1957 but only three-fifths of the peak reached in 1960. After the withdrawal of the Soviet technicians in mid-1960, the Chinese found that they could not operate many of the heavy industrial plants built as Soviet aid projects, and they were forced to cut production drastically. In light industry, the levels of output achieved during the Leap Forward could not be maintained because of shortages of agricultural raw materials. Even without these blows to the economy, however, the dislocation of industry, the exhaustion of the labor force, and the crisis in the food supply would probably have been severe enough to cause the collapse of the Leap Forward.

By 1962, more rational policies prevailed and industry began to recover; by 1965 most major commodities were being produced at earlier peak levels. This recovery, however, consisted primarily of regaining lost ground and resulted from a fuller use of existing capacity. Industrial policy during the period was aimed more at increasing the range of finished products in support of a few major programs than at a general expansion of the industrial base.

E. The Cultural Revolution and Its Aftermath, 1967–70

The industrial revival that started in 1962 after the collapse of the Leap Forward was interrupted toward the end of 1966 by a new period of turmoil, the Great Proletarian Cultural Revolution. Unlike the Leap Forward, the Cultural Revolution was not primarily an economic movement; nevertheless, it was the source of widespread, often violent, change that affected the performance of industry.

The first large-scale disruptions occurred in the winter of 1966–67, when workers and students were encouraged to conduct political campaigns in factories and mines. Industrial production was affected almost immediately by work stoppages, shortages of raw materials, and disruptions of transportation. Efforts were made to restore production during the spring of 1967, but they were only partly successful.

In May 1967 a new and more disruptive phase of the Cultural Revolution began which lasted until September. Civil disorder was widely reported in major industrial centers during the period. Transport in all parts of China became subject to severe, although sporadic, disruption that choked the flow of raw materials to industrial installations. Factories representing a broad spectrum of industry and all major industrial areas were forced to curtail operations or shut down completely for days or even weeks. In September 1967 Chinese military authorities received sweeping authority to deal with civil disturbances and restored a semblance of order to the country. Shortages of coal, however, were extremely serious in the winter of 1967–68 and contributed to a continued low level of production in many other industries. Only in the late spring and early summer of 1968 did industrial production begin to return to normal levels.

Thus work stoppages, shortages of raw materials, and disruptions of transportation caused by the Cultural Revolution forced industrial production below the 1966 level in both 1967 and 1968. No accurate measure of the decline in production can be made, but it may have been on the order of 10 to 15 percent in 1967. Production remained at a low level at least through the first half of 1968, and then began to recover rapidly. By 1969, it exceeded the pre-Cultural Revolution peak of 1966, and in 1970 went on to grow at a rate of about 18 percent. The average annual rate of growth for the period 1966–70 as a whole, however, was a modest 9 percent.

F. The Start of the Fourth Five-Year Plan, 1971–73

After rapid increases in 1969 and 1970, the growth of industrial output fell off markedly in 1971 as production pushed up against capacity. During the early 1960's, construction was limited primarily to completion of projects that had been started in the late 1950's. By 1964 or 1965, a broader construction program appears to have been started. During the Cultural Revolution, however, when the production of steel, cement, and timber was down and transportation was often disrupted, construction activity suffered. Thus, because of the low level of construction activity that had prevailed in the previous several years, new capacity was not being added rapidly enough to sustain a high rate of growth.

In addition, shortages of coal, iron ore and other basic raw materials began to affect production of both producer and consumer goods. These shortages reflect fundamental imbalances in extractive, processing and finishing industries. In metallurgy, for example, investment had been concentrated too heavily on the development of crude steel capacity; the development of mining and finished steel capacity had been neglected.

Coming on top of these difficulties, poor performance in agriculture forced major changes in priorities in 1972 and 1973. Whatever the initial goals of the Fourth Five-Year Plan, it is clear that the revisions gave first priority to industrial support of agriculture and to expansion of exports. Thus, the problem of feeding and clothing the population forced Peking to defer grappling with the structural imbalances that have held down the rate of growth in industry until the next five-year plan, which begins in 1976.

III. The Regional Structure of Industrial Production

China's natural resources are well dispersed. In contrast, the historical process of development had resulted in a highly uneven geographical distribution of industrial capacity at the time the Communists came to power. Industrial capacity was concentrated in Northeast, North, and East China,[12] where a combination of relative political stability, a modern transport system, readily available agricultural and industrial raw materials, and large markets had attracted foreign capital. Smaller industrial centers had developed in Southwest China during World War II when industrial plant and equipment were removed from coastal cities in the face of advancing Japanese armies and in several provinces where enterprising warlords had built small industrial complexes.

[12] The groupings of provinces, autonomous regions and centrally administered municipalities used in this paper are as follows:

	Coastal area	Inland area
Northeast	Liaoning	Heilungkiang, Kirin.
North	Peking, Tientsin, Hopeh, Shantung.	Honan, Inner Mongolia, Shansi.
East	Shanghai, Chekiang, Kiangsu	Anhwei.
Central		Hunan, Hupeh, Kiangsi.
South	Fukien, Kwangtung	Kwangsi.
Southwest		Kweichow, Szechwan, Tibet, Yunnan.
Northwest		Kansu, Ningsia, Shensi, Sinkiang, Tsinghai.

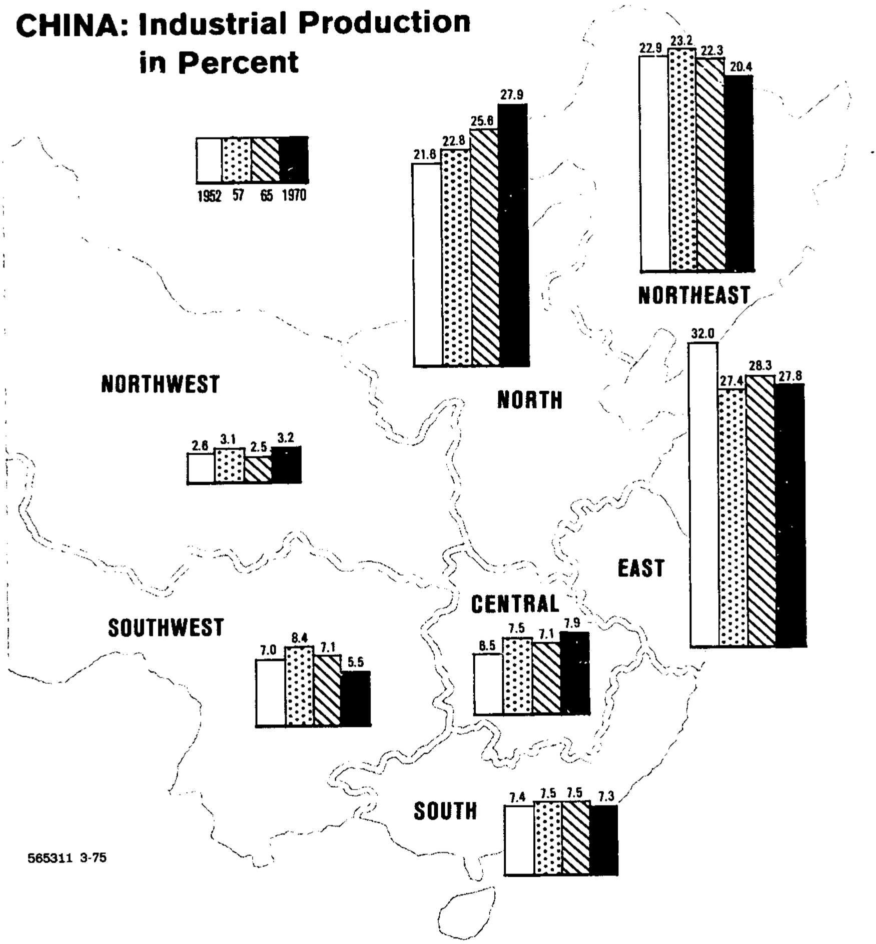
As measured by the indexes presented in table 3 and figure 1, three-fourths of total industrial production in 1952 originated in the three relatively well-developed regions. Faced with this unbalanced distribution of industrial capacity the Chinese undertook a deliberately phased policy of regional development. The specific provisions governing the geographical distribution of industrial capital construction were as follows: (1) Expansion of existing industrial bases, especially in Northeast China, in order to support the construction of new industrial areas; (2) construction of new industrial bases in North China and Central China, centering around two new iron and steel complexes to be built in Pao-t'ou and Wu-han; and (3) the construction of a new industrial base in Southwest China.

TABLE 3.—CHINESE INDUSTRIAL PRODUCTION, BY REGION

	1952	1957	1965	1970
Total	100	208	415	653
		100	199	313
			100	157
Northeast	100	212	406	583
		100	192	276
			100	144
North	100	220	482	843
		100	219	383
			100	175
East	100	178	367	567
		100	206	318
			100	154
Central	100	241	455	789
		100	189	328
			100	173
South	100	211	420	643
		100	199	304
			100	153
Southwest	100	252	426	516
		100	169	204
			100	121
Northwest	100	244	401	797
		100	164	326
			100	199

Note: The regional indexes were calculated by deflating gross value indexes derived from the data in table B-8 by the ratio of value added to gross value for the country as a whole. The assumption implicit in the calculation is that the bias in the gross value data is the same in each geographic area.

Figure 1



During the First Five-Year Plan period, the most rapidly developing areas were the less-industrialized regions in central and western China, which made up less than 25 percent of industrial output. Growth in the East was the lowest because of the deliberate decision not to let the city of Shanghai continue to dominate industrial output. The East dropped from 32 percent of industrial output in 1952 to 27 percent in 1957, but it was still the largest region. North China was the fastest growing of the more-developed regions largely because the relatively backward provinces within the region grew extremely rapidly.

With the collapse of the Leap Forward and the severe economic problems that followed, the rate of growth dropped in every region. The drop was more severe for the central and western parts of the country. In the recovery of 1962–65, the star performer was the North, which had become the second largest region by 1965.

Between 1965 and 1970, the growth of industrial production was interrupted by the Cultural Revolution. Rates of growth were lower than the Chinese would have liked, but the pattern of growth followed the blueprint drawn up in the 1950's. North and Central China both continued to increase their relative share, while East China declined further. The rate of growth in the Southwest must have been a major disappointment. A large number of large-scale construction projects had been completed—especially in Szechwan—but the rate of growth of the region was well below average and its relative share in output fell.

It is interesting to speculate on what might lie behind the cryptic reference in Premier Chou En-lai's work report to a 10-year plan that is to run concurrently with the 5-year planning cycle.[13] If it were no more than preliminary targets for the sixth Five-Year Plan (1981–1985), would he have referred to it as a 10-year plan? In 1956, for example, when the second Five-Year Plan was being drawn up, tentative targets for key commodities were given for 1967 and 1972, that is, for 10- and 15-year periods. The 10-year plan will probably be more than national targets for 1985. Given the current emphasis on self-sufficiency and hints that the number of provinces may be increased, the 10-year plan could be directed toward achieving a better regional balance in output. Whether that would mean a return to the regional administrative areas of the early 1950's with a formal organization and bureaucracy, or a revival of the more shadowy economic coordination regions of the late 1950's, or merely an attempt to achieve regional balance through the current national planning mechanism is more than anyone outside Peking can say. In any case, it seems clear that the central government has retained control over key economic decisions and has the power to redistribute investment funds as it wishes.

In summary, the Chinese have persisted in their plans for the regional development of the country through thick and thin. The plan—which was first to repair the industrial centers damaged during World War II, then to build new industrial bases in North and Central China, and finally to develop the Southwest and the Northwest—is taking much longer than they had anticipated. Production was restored and the relative importance of the Northeast and East has begun to decline. Pao-t'ou and Wu-han are well established bases and the relative share of output in North and Central China has increased. But the Southwest has failed to develop rapidly despite the construction of the new industrial complexes, and the regional structure of industrial production has not been changed dramatically. The gestation period required for investment to have an impact on growth rates seems to have been much longer than the Chinese had anticipated. It has only been in the last 10 years that North China has increased its relative share noticeably. It seems likely that the

[13] Chou En-lai, "Report on the Work of the Government," *Peking Review*, Jan. 24, 1975, p. 23.

investment in the Southwest will start to pay off over the next 5 years but it will take another 10 to 15 years for the Chinese to achieve the goals they set for themselves in the early 1950's.

IV. Industrial Performance in 1974

In his report to the National People's Congress,[14] Premier Chou presented more statistical information on industry than had appeared in any single speech or article since he gave an interview to the late Edgar Snow during the winter of 1970–71.[15] Chou gave 1974 index numbers (with 1964=100) for the output of eight industrial commodities, ranging from crude oil to cotton yarn, and stated that the gross value of industrial output in 1974 was 2.9 times the level of 1964. The selection of 1964 as the base for comparison is logical—it is an even 10-year period and the previous National People's Congress met in 1964—but it is unfortunate from our point of view because absolute figures have never been published for 1964. In addition, focusing on the longer period draws attention away from performance in 1974, when industry grew by only 4 percent, and from China's current economic problems.

The average annual rates of growth derived from Chou's statement and reported or estimated rates of growth in 1974 are presented in table 4, together with the estimated level of production. The one bright spot in the economy was the petroleum industry which continued its rapid rate of growth. Other producer goods grew only slowly at best. The production of chemical fertilizer was about the same as it was in 1973 and the production of crude steel declined by nearly 2 million tons. The performance of consumer goods was no better. The output of goods manufactured from industrial raw materials probably did relatively well; most goods that depend on agricultural raw materials did not. The output of cotton cloth was about the same as in 1973 and the output of sugar dropped nearly 2 percent. For every commodity except timber, growth in 1974 was below the average for the last 10 years.

TABLE 4.—INDICATORS OF CHINESE INDUSTRIAL PRODUCTION, 1974

	Average annual rate of growth 1964–74		Percentage change 1973–74		
	Reported	Estimated	Reported	Estimated	Estimated production in 1974
Electric power	11.6			6.9	108 billion kilowatthours.
Coal	6.7			3.2	389 million M.T.
Crude oil	22.3		20		65.3 million M.T.
Refined products			13		
Crude steel	8.2			−6.7	23.8 million M.T.
Tractors	20.0				
Agricultural machinery			14.6		
Chemical fertilizer	15.7			(1)	24.8 million M.T.
Large scale		9.2		4.5	9.5 million M.T.
Small scale		23.3		−2.0	15.3 million M.T.
Cement		11.2		5.7	31.6 million M.T.
Large scale		5.7		2.0	15.2 million M.T.
Small scale		22.5		9.3	16.4 million M.T.
Timber		4.5		6.0	53 million cubic M.
Chemical fibers	15.7				
Cotton yarn	6.3				
Cotton cloth		4.1		(1)	7.6 million linear M.
Wool cloth					65.2 million linear M.
Sugar		7.8		−1.8	2.19 million M.T.

[1] Negligible.

[14] Chou En-lai, *op. cit.*, p. 22.
[15] Edgar Snow, "Talks with Chou En-lai," *The New Republic*, Mar. 27, 1971, p. 20.

The picture that emerges from the national physical output data also is reflected in the provincial claims for the gross value of industrial output. Data on the growth of output over the corresponding period of 1973 are presented in table 5. The fact that figures covering 9 months or more are available for only 5 out of 29 provinces suggests how little progress there was to report.

TABLE 5.—PERCENTAGE INCREASE IN THE GROSS VALUE OF INDUSTRIAL OUTPUT OVER THE CORRESPONDING PERIOD OF 1973, FOR SELECTED PROVINCES, BY LENGTH OF PERIOD IN 1974

Province	Number of months						
	6	7	8	9	10	11	12
Liaoning		(1)					6.3.
Heilungkiang	9.1			6.2			5.8.
Hopeh				10.2	10.7		12.3.
Honan	13						
Peking	(2)						Considerable increase.
Tientsin	(3)						All time high.
Kiangsu	(4)						
Shanghai	6.2						Marked.
Kwangtung	5.66			(5)			
Tibet	32.67						
Shensi							Greater.
Kansu	8.2	8.21		8.4	8.9	9.1	
Tsinghai							5.7.

1 Marked.
2 Remarkable.
3 Big margin.
4 About the same level.
5 Greater.

The anti-Confucius campaign seems to have made itself felt throughout industry. Workers, dissatisfied with low wages and living standards, engaged in sporadic work stoppages, and absenteeism was high. The upshot was that many industries were well below the levels of production necessary to meet their goals.

By midyear the situation was serious enough for the Central Committee of the Chinese Communist Party to issue Directive No. 21, which focused on the economic difficulties caused by the excesses of the political campaign.[16] The Central Committee stated specifically that the production of coal in the first 5 months of the year was 8.35 million tons short of the national target, and that the shortage of coal had affected major rail lines and a long list of industries including iron and steel, nonferrous metals, chemical fertilizer, and cement. To remedy these deficiencies, the Central Committee called for cadres to strengthen their leadership, for production to be put on a par with revolution, and for disciplinary action to be taken against workers and cadres who left their posts without permission.

The extent to which production actually declined and how successful the Chinese have been in restoring it are hard to assess. The monthly indexes of industrial output presented in table 6 throw some light on the situation during the summer and fall. It must have been nice to be able to report, as Kirin did, that production in September was 21 percent above production in August, but a moment's reflection indicates that rates of growth like this only show how bad the situation had been the previous month. For example, the lowest monthly growth rate, the 2.8 percent reported for light industry in Szechwan, is the equivalent of 40 percent annually. If rates of growth had been anything like 40 percent, they surely would have been reported.

16 New York Times, Nov. 15, 1974, p. 3.

TABLE 6.—MONTHLY INDEXES OF INDUSTRIAL OUTPUT, FOR SELECTED PROVINCES, 1974

	July	August	September	October	November	December
Kirin		100	121.0			
Honan: Coal			100.0	109.8		
Shansi	100	104.18	117.1			
Anhwei			100.0	116.0		
Hupeh				100.0	116.83	
Wu-han				100.0	114.9	121.7
Hunan: Light industry			100.0	106.8		
Kiangsi	100	105.1				
Coal	100	116.8				
Pigiron	100	187.5				
Steel	100	240				
Szechwan: Light industry	100	102.8	112.7			
Ch'eng-tu: Light industry				100.0	128.0	
Kweichow				100.0	112.8	
Yunnan	100	117.1	126.6			
Shensi				100.0	140.0	
Coal				100.0	116.0	
Machine building				100.0	147.8	
Light industry and textiles				100.0	112.0	

The rates of growth reported in the late summer and early fall of 1974 indicate that political interference in the factories had begun to ebb and that the tempo of industrial production had begun to edge up. The fact that provinces were still reporting large monthly increases in October and November, however, shows how slow the recovery was. Indeed, some areas had not fully recovered by yearend. In Hupeh, for example, output of 32 out of 70 major products in January was less than in January 1974.[17]

V. Prospects for 1975 and Beyond

Despite accumulating structural problems and the poor performance in 1974, industrial production in the remainder of the decade should get back to the recent growth trend of 8 to 10 percent. The reduction in the number of economic ministries and commissions—from 40 to 26 and from 12 to 3, respectively—was announced at the National People's Congress in January 1975. Furthermore, Chou En-lai's statement that China is drawing up a 10-year plan in addition to the regular 5-year and annual plans suggest that centralized planning and management of the economy is being tightened. And this tightening will be reinforced by the current campaign to impose "the dictatorship of the proletariate." Among other objectives, the campaign is designed to provide the discipline necessary for a period of orderly economic development.

Chou singled out the Fifth Five-Year Plan period (1976–1980) as crucial for the attainment of "front rank" status for China by the end of the century. The basic economic problem for the People's Republic of China is to boost the growth rate of grain production well above the rate of population growth. The degree of success the Chinese have in promoting birth control and in raising agricultural production will be important determinants of the rate of industrial growth, influencing, for example, the amount of investment resources that can be spared for the expansion and modernization of heavy industry.

By purchasing 13 of the world's largest ammonia-urea fertilizer complexes, China has set the stage for a possible breakthrough in agriculture in the early 1980's. These purchases will affect industrial

[17] Putting its best foot forward, Hupeh reported that output of 38 out of 70 major products was greater than in January last year. See *FBIS*, Mar. 4, 1975, H1.

growth in three ways. First, the output of fertilizer will increase the value of industrial output directly; second, the increased availability of fertilizer will mean increased production of agricultural raw materials and thus have an indirect impact on growth; and third, the foreign exchange currently needed to purchase grain and fertilizer will be freed for the purchase of machinery and equipment. To the extent that population growth is curbed, additional foreign exchange will be available for industrial investment.

In general, Chou called for balanced efforts to promote growth. Thus, the judgment that growth will be relatively slow while the structural imbalances in industry are being corrected seems sound. The Chinese long-run objective is to catch up with the West, and what they are doing now and what they seem to be planning for the next 5 to 6 years could set the stage for a new wave of rapid growth. There are, however, certain hazards. First, the current widespread demands for higher wages appear to be a genuine expression of the workers' desire for a higher standard of living. Holding down material incentives and depending on discipline may do for the moment, but the potential for disruption is always there. Second, if industry falters, or if the current policies do not pay off in higher growth rates by the end of the decade, the pressure for a radical solution may be overwhelming. The Chinese might try a new leap in a desperate effort to achieve the industrial status for which they hunger. These hazards are present during a period in which the People's Republic is grappling with a leadership succession problem. If economic shortcomings become issues in the succession itself, their potential for disrupting Chinese industrial growth is unprecedented.

In summary, the prospects are for a period of moderate growth in industry with emphasis on achieving balance, but with the ever-present possibility of breakdown due to political disruption, worker discontent or a desperate attempt to accelerate the rate of growth.

Appendix A

Description of the Index

The index of industrial production for the People's Republic of China presented here is a substantial revision of the index prepared for the Joint Economic Committee in 1966 [18] and brought up to date in 1971.[19] The three principal changes are: (1) the number of commodities included in the index for the years since 1957 has been increased from 11 to 27; (2) the development of a new index number technique has made it possible to include physical output series for which the data are not complete; [20] and (3) the index has been restructured to facilitate comparison with a reconstruction of the official index.[21]

I. For the Years 1949–57

Indexes showing the growth of production for individual branches of industry, for producer and consumer goods, and for industry and handicrafts are presented in table A–1.

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[18] Robert Michael Field, "Chinese Communist Industrial Production," *An Economic Profile of Mainland China,* Joint Economic Committee of the U.S. Congress, Washington, D.C. 1967, pp. 269–295.

[19] Robert Michael Field, "Chinese Industrial Development: 1949–1970," *People's Republic of China: An Economic Assessment,* Joint Economic Committee of the U.S. Congress, Washington, D.C., 1972, pp. 61–85.

[20] For a description of the technique, see Appendix C.

[21] For an analysis of the reconstructed official data, see Robert Michael Field, Nicholas R. Lardy, and John Philip Emerson, *A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–1973,* U.S. Department of Commerce, forthcoming.

TABLE A-1.—DERIVATION OF THE INDEX OF CHINESE INDUSTRIAL PRODUCTION, 1949-57

	Weights			1949	1950	1951	1952	1953	1954	1955	1956	1957
Total industrial production			100.00	22.55	31.03	42.43	54.27	68.49	79.59	81.99	100	113.07
Producer goods			54.33	16.53	24.70	35.35	46.36	60.62	73.38	78.39	100	118.49
Consumer goods			45.47	29.76	38.61	50.93	63.75	77.93	78.05	86.30	100	106.56
Industry		100.00	83.48	21.50	28.56	40.39	52.59	66.58	77.63	81.07	100	112.88
Producer goods	100.00	60.82		16.13	24.06	34.95	45.95	59.92	72.59	78.24	100	117.95
Electric power	4.15			25.96	27.42	34.65	43.76	55.41	66.30	73.80	100	116.56
Coal	23.36			29.25	38.71	47.87	59.98	62.85	75.46	88.37	100	117.29
Petroleum	1.75			10.40	17.20	26.23	37.49	53.48	67.84	83.06	100	125.37
Ferrous metals	11.35			3.73	12.24	21.28	34.48	46.24	54.93	69.07	100	133.28
Machine building	21.79			9.37	15.69	27.14	36.83	56.01	66.45	68.68	100	111.09
Chemical processing	5.49			9.38	16.27	28.94	38.14	47.53	63.11	75.96	100	119.33
Building materials	18.71			10.34	22.06	38.95	44.75	60.64	71.95	70.44	100	107.30
Timber	11.10			25.09	29.75	35.20	53.04	83.32	105.88	100.11	100	134.14
Paper	2.30			14.82	19.29	33.03	50.98	58.56	71.07	78.79	100	125.19
Consumer goods	100.00	39.18		29.84	35.55	48.83	62.91	79.92	85.44	85.45	100	105.01
Textiles	50.36			24.60	34.37	45.33	61.36	74.88	85.27	77.85	100	94.00
Food processing	49.64			35.17	36.75	52.39	64.48	78.98	85.62	93.17	100	116.17
Handicrafts		100.00	16.52	27.83	43.48	52.76	62.73	78.14	89.53	86.64	100	114.00
Producer goods		22.73		21.95	33.45	40.77	51.92	70.03	83.97	80.49	100	125.78
Consumer goods		77.27		29.56	46.43	56.29	65.91	80.52	91.17	88.45	100	110.53

A. INDUSTRY

The index for industry was constructed from Chinese data on the physical output of 42 commodities produced by 11 branches of industry. These data were weighted in three stages. In the first stage the output series were grouped by branch of industry and indexes were calculated separately for each branch. The indexes for seven branches of industry—electric power, coal, petroleum, ferrous metals, building materials, timber, and paper—were each based on a single commodity. The indexes for the chemical processing, textile, and food processing industries were based on a sample of the commodities produced by these branches weighted by their respective prices.

The construction of the index for the machine-building industry was more complex. For the years 1952–57 the index was calculated from physical output data. Because the commodities produced by the machine-building industry are extremely diversified, they were divided into categories that are more homogeneous than the industry as a whole. Then a two-stage index was constructed in which prices were used as weights within the individual categories and the relative shares of the gross value of output as weights between categories.[22] For the years 1949–51 this procedure could not be used because the sample of physical output data was restricted to a small number of products that grew much faster than was typical of the industry as a whole. For these years the index was computed by adjusting the official data to allow for the difference in the rates of growth shown during the First Five-Year Plan period by the official index of gross value and the estimated index of value added.

In the second stage of aggregation, indexes for producer and consumer goods were obtained by combining the indexes for the individual branches. The weights employed were the relative shares of the wage bill paid to workers employed in those branches of industry that are included in the index. In the third stage, an index for industry as a whole was derived using wage bill weights that had been adjusted to account for the degree of coverage in the producer and consumer goods sectors. The derivation of the weights is presented in table A–2.

TABLE A-2.—DERIVATION OF WEIGHTS FOR THE INDEX OF CHINESE INDUSTRIAL PRODUCTION, 1949–57

	Gross value [1]	Share of wage bill among included branches [2]	Adjusted share of wage bill	Final weights
Total, excluding repair	57,744		[3] 117.66	100.00
Producer goods	28,249		[4] 71.56	60.82
Included	[5] 20,725	[5] 52.50		100.00
Electric power	928	2.18		4.15
Coal	1,510	12.26		23.36
Petroleum	650	.92		1.75
Ferrous metals	4,113	5.96		11.35
Machine building	5,361	11.44		21.79
Chemical processing	3,652	2.88		5.49
Building materials	1,475	9.82		18.71
Timber	1,718	5.83		11.10
Paper	1,318	1.21		2.30
Excluded	[6] 7,524			
Consumer goods	29,495		[4] 46.10	39.18
Included	[5] 22,918	[5] 35.82		100.00
Textiles	11,154	18.04		50.36
Food processing	11,764	17.78		49.64
Excluded	[6] 6,577			

[1] Tables B-5, and B-6.

[2] Robert Michael Field, "Chinese Industrial Development: 1949-71," "People's Republic of China: An Economic Assessment," Joint Economic Committee of the U.S. Congress, Washington, D.C., 1972. p. 76. The branch weights do not add to 100 because the consumer goods portion of machine building, and metal products and repair have been excluded from the metal processing sector, and the producer goods portion has been excluded from textiles.

[3] Derived as the sum of producer and consumer goods.

[4] Derived on the assumption that the relative share of the wage bill paid to workers employed in the included branches was the same proportion of producer goods and consumer goods, respectively, as the share of these branches in the gross value of output.

[5] Derived as the sum of the included branches.

[6] Derived as producer and consumer goods less included branches, respectively.

[22] For a complete description of the machine-building index, see Robert Michael Field, "The Chinese Machine-Building Industry: A Reappraisal," *The China Quarterly*, April–June 1973, pp. 308–320.

B. HANDICRAFTS

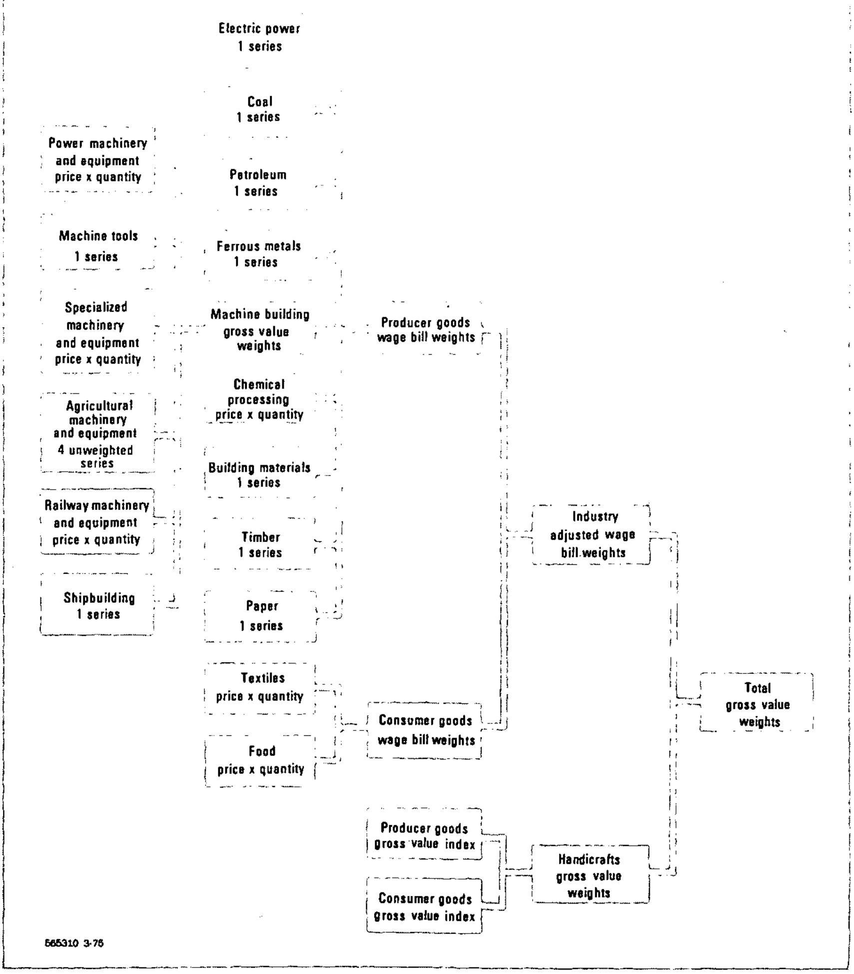
The index of handicraft production was not calculated from physical output data because data were available for only eight commodities produced by handicrafts and the output of these commodities was not typical of handicrafts as a whole. Instead, the index was derived from official indexes for handicrafts producer and consumer goods. These indexes were weighted by the relative shares of the gross value of handicraft output, excluding repair, in 1956. The value of repair should have been excluded from the index of handicraft producer goods, but information on year-to-year changes in repair was not available.

C. TOTAL INDUSTRIAL PRODUCTION

The index of total industrial production was obtained by weighting the indexes for industry and handicrafts by the relative shares of the gross value of output, excluding repair, in 1956. Independent estimates of the values added in industry and handicrafts could not be used as weights because the data on the earnings of handicraft workers necessary to calculate the weights were not available and could not be estimated. The structure of the index for the 1950's and the nature of the weights used in each stage of aggregation is summarized in figure 2.

Figure 2

Structure of the Industrial Index for the Years 1949-1957



II. For the Years 1958–74

The system of weights used to calculate the index for the years 1949–57 was not used for the years 1958–74 because handicraft production could not be separated from the production of industrial enterprises and because the number of output series for which estimates are available was reduced. For example, only one complete series was available for such important branches of industry as textiles and food processing. The procedure used was to group the series by sector—namely, machine building, other producer goods, and consumer goods—and weight them by their respective prices. The resulting sectoral indexes were then aggregated using an adjusted set of weights. The derivation of the index is presented in table A–3, the derivation of the weights in table A–4, and the physical output series in tables B–1, B–2, and B–3.

TABLE A-3.—DERIVATION OF THE INDEX OF CHINESE INDUSTRIAL PRODUCTION, 1958–74

	Total	Producer goods	Machinery	Other producer goods	Consumer goods
Weights	100.00	54.53	11.06	43.47	45.47
1957	100.00	100.00	100.00	100.00	100.00
1958	144.77	165.91	174.94	163.79	116.57
1959	177.00	211.77	241.53	204.78	130.63
1960	184.15	236.71	274.17	227.91	114.06
1961	108.04	128.88	116.11	131.88	80.24
1962	114.16	137.87	140.28	137.31	82.54
1963	136.86	157.64	178.19	152.81	109.14
1964	162.74	183.44	212.93	176.52	135.13
1965	199.38	211.98	262.95	200.01	182.58
1966	230.71	249.69	325.52	231.89	205.40
1967	201.90	207.42	273.38	191.93	194.55
1968	222.10	227.95	291.64	213.00	214.29
1969	264.62	288.58	455.09	249.49	232.67
1970	313.33	345.25	572.72	291.84	270.75
1971	341.15	394.70	645.35	335.86	269.73
1972	370.73	428.22	677.49	369.70	294.05
1973	415.80	478.28	753.78	413.60	332.46
1974	432.27			429.41	341.00

TABLE A-4.—DERIVATION OF WEIGHTS FOR THE INDEX OF CHINESE INDUSTRIAL PRODUCTION, 1958–74

	Industry [1]	Handicrafts [2]	Total
Share of industry and handicrafts [3]	83.48	16.52	100.00
Total	100.00	100.00	100.00
Producer goods	60.82	22.73	54.53
Machine building	13.25		11.06
Other	47.57	22.73	43.47
Consumer goods	39.18	77.27	45.47

[1] Table A-2.
[2] The relative share of the gross value of handicraft output, excluding repair, from table B-5.
[3] The relative share of the gross value of industrial and handicraft output from table B-5.

Appendix B

Statistical Tables

TABLE B-1.—CHINA: ESTIMATED PRODUCTION OF SELECTED TYPES OF MACHINERY, 1949-74

	Electric generators (kilowatts)	Machine tools (units)	Spindles (units)	Sewing machines (thousands)	Powered irrigation equipment (thousand horsepower)	Tractors[1] (15 hp units)			Mainline locomotives (units)				Freight cars (units)	Merchant vessels (LSD tons)	Motor vehicles (units)
						Total	Conventional	Garden	Total	Steam	Diesel	Electric			
1949	10,181	1,582											3,155		
1950	22,798	3,312											696		
1951	31,731	5,853	131,984										2,882		
1952	29,678	13,734	383,128						20	20			5,792	6,100	
1953	59,525	20,502	287,424	257					10	10			4,501	14,800	
1954	54,617	15,901	489,044	316					52	52			5,446	31,400	
1955	107,595	13,708	304,400	174					98	98			9,258	50,200	
1956	288,263	25,928	784,020	206	170				184	184			7,122	51,200	1,654
1957	312,200	28,297	484,000	278	52				167	167			7,300	46,400	7,500
1958	1,425,000	30,000	1,000,000	637	720	1,100	1,100		350	346	2	2	11,000	56,600	16,000
1959		35,000	1,360,000	563	1,255	9,400	9,400		533	530	3		17,000	64,500	19,400
1960		40,000		676	1,610	23,800	23,800		602	600		2	23,000	41,400	15,000
1961		30,000			700	16,200	16,200		100	100			3,000	28,200	1,000
1962		25,000			955	20,900	20,900		25	25			4,000	23,100	8,400
1963		35,000			640	24,600	24,600		27	25		2	5,900	25,800	16,800
1964	625,000	40,000	700,000	1,257	860	29,347	29,200	147	27	25	2		5,700	34,200	20,300
1965	780,000	45,000	1,400,000	1,571	1,150	33,271	32,300	971	50	20	30		6,600	29,100	30,000
1966		50,000			1,530	46,138	43,100	3,038	140	70	70		7,500	19,800	43,000
1967		40,000				43,089	38,100	4,989	200	100	100		6,900	22,500	32,000
1968		45,000				47,797	40,400	7,397	240	100	140		8,700	48,000	27,000
1969		55,000		1,800		57,993	47,800	10,193	261	100	160	1	11,000	108,900	60,000
1970		70,000		2,400		73,313	58,600	14,713	285	100	180	5	12,000	193,200	70,000
1971		75,000		3,000	3,089	90,923	68,300	22,623	205		200	5	14,000	231,900	86,000
1972	3,500,000	75,000		3,300	4,016	106,863	75,200	31,663	225		220	5	15,000	163,500	100,000
1973		80,000		3,894	5,984	133,263	90,300	42,963	240		240		16,000	161,700	110,000
1974															

[1] Preliminary estimates.

TABLE B-2.—CHINA: ESTIMATED PRODUCTION OF SELECTED PRODUCER GOODS, 1949–74

	Electric power (million kWh)	Thousand metric tons					
		Coal	Crude oil	Iron ore	Pig iron	Crude steel	Finished steel
1949	4,308	32,430	121	589	252	158	123
1950	4,550	42,920	200	2,350	978	606	360
1951	5,750	53,090	305	2,703	1,148	896	690
1952	7,261	66,490	436	4,287	1,929	1,349	1,110
1953	9,195	69,680	622	5,821	2,234	1,774	1,490
1954	11,001	83,660	789	7,229	3,114	2,225	1,770
1955	12,278	98,300	966	9,597	3,872	2,853	2,220
1956	16,593	110,360	1,163	15,484	4,826	4,465	3,220
1957	19,340	130,732	1,458	17,670	5,936	5,350	4,290
1958	28,000	230,000	2,300	59,000	13,690	11,100	6,100
1959	42,000	300,000	3,700	83,000	20,500	13,400	8,100
1960	47,000	280,000	5,500	100,000	27,500	18,700	11,500
1961	31,000	170,000	5,300	—	8,800	8,000	6,000
1962	30,000	180,000	5,800	—	8,800	8,000	6,000
1963	33,000	190,000	6,400	—	9,900	9,000	6,800
1964	36,000	204,000	8,700	—	11,900	10,800	8,100
1965	42,000	220,000	10,800	38,800	13,800	12,500	9,400
1966	50,000	248,000	13,900	—	16,600	15,000	11,200
1967	45,000	190,000	13,900	—	13,200	12,000	9,000
1968	50,000	205,000	15,200	—	15,400	14,000	10,500
1969	60,000	258.000	20,300	49,500	17,600	16,000	12,000
1970	72,000	310,000	28,500	73,200	22,000	17,800	13,400
1971	86,000	335,000	36,700	92,300	27,100	21,000	15,400
1972	93,000	356,000	43,000	104,800	30,400	23,000	16,900
1973	101,000	377,000	54,500	108,600	33,700	25,500	19,100
1974	108,000	389,000	65,300	101,500	31,500	23,800	17,800

	Chemical fertilizer (thousand metric tons) [1]							
		Nitrogen [2]			Phosphorus [3]			
	Total	Total	Large scale	Small scale	Total	Large scale	Small scale	Potassium [4]
1949	27	27	27	—	—	—	—	—
1950	70	70	70	—	—	—	—	—
1951	137	137	137	—	—	—	—	—
1952	194	194	194	—	—	—	—	—
1953	263	263	263	—	—	—	—	—
1954	343	343	343	—	—	—	—	—
1955	426	418	418	—	8	8	—	—
1956	663	586	586	—	77	77	—	—
1957	803	683	683	—	120	120	—	—
1958	1,350	1,010	1,010	—	340	340	—	—
1959	1,880	1,380	1,380	—	500	500	—	—
1960	2,520	1,720	1,720	—	800	600	200	—
1961	1,850	1,450	1,430	20	400	300	100	—
1962	2,780	2,220	2,160	60	560	360	200	—
1963	3,860	2,830	2,730	100	1,030	450	580	—
1964	5,780	3,560	3,350	210	2,220	600	1,620	—
1965	7,600	4,150	3,830	320	3,450	750	2,700	—
1966	9,600	4,830	4,230	600	4,680	1,440	3,240	90
1967	8,100	4,040	3,450	590	3,890	1,300	2,590	170
1968	9,500	5,200	3,500	1,700	4,070	1,370	2,700	230
1969	11,300	5,900	3,800	2,100	5,150	1,500	3,650	250
1970	14,000	7,810	4,450	3,360	5,900	1,550	4,350	290
1971	16,800	9,500	4,750	4,750	6,950	1,620	5,330	350
1972	19,880	11,800	5,780	6,020	7,700	1,920	5,780	380
1973	24,760	14,400	6,620	7,780	9,940	2,480	7,460	420
1974	24,880	15,810	7,900	7,900	8,620	1,620	7,000	450

Footnotes at end of table.

TABLE B-2.—CHINA: ESTIMATED PRODUCTION OF SELECTED PRODUCER GOODS, 1949–74—Continued

	Cement (thousand metric tons)				
	Total	Large plants	Small plants	Timber (thousand M [3])	Paper (thousand metric tons)
1949	661	661	…	5,760	228
1950	1,410	1,410	…	6,640	380
1951	2,490	2,490	…	7,640	492
1952	2,861	2,861	…	11,200	603
1953	3,877	3,877	…	17,530	667
1954	4,600	4,600	…	22,210	842
1955	4,503	4,503	…	20,930	839
1956	6,393	6,393	…	20,840	998
1957	6,860	6,860	…	27,870	1,221
1958	10,700	9,300	1,400	35,000	1,600
1959	12,300	10,600	1,700	41,200	1,700
1960	12,000	9,000	3,000	33,000	1,700
1961	8,000	6,000	2,000	27,000	1,000
1962	6,900	5,100	1,800	29,000	1,000
1963	9,100	6,600	2,500	32,000	1,100
1964	10,900	8,700	2,200	34,000	1,500
1965	14,800	10,900	3,900	36,000	1,700
1966	16,900	12,500	4,400	38,000	1,800
1967	14,200	10,600	3,600	30,000	1,700
1968	17,400	12,700	4,700	32,000	1,700
1969	19,600	13,700	5,900	35,400	1,800
1970	19,800	13,800	5,900	40,000	2,000
1971	23,000	13,800	9,200	43,000	…
1972	27,500	14,300	13,200	46,400	…
1973	29,900	14,900	14,900	50,000	…
1974	31,600	15,200	16,400	53,000	…

[1] Components may not add to the total because of rounding.
[2] Production is measured in standard units of 20 percent nitrogen.
[3] Production is measured in standard units of 18.7 percent phosphoric acid.
[4] Production is measured in standard units of 40 percent potassium oxide.

TABLE B-3.—CHINA: ESTIMATED PRODUCTION OF SELECTED CONSUMER GOODS, 1949–74

	Bicycles (thousands)	Thermos bottles (thousands)	Cotton cloth (million linear meters)	Wool cloth (thousand linear meters)	Silk cloth (thousand linear meters)	Sugar (thousand metric tons)	Wine and liquor (thousand metric tons)
1949	14	…	1,889	5,435	50,160	199	…
1950	21	…	2,522	4,880	51,120	242	…
1951	44	…	3,058	4,025	63,300	300	…
1952	80	5,536	3,829	4,233	64,760	451	230
1953	165	12,007	4,685	6,227	73,800	638	…
1954	298	14,841	5,230	7,823	78,250	693	…
1955	335	17,958	4,361	10,271	93,970	717	…
1956	640	16,310	5,770	14,267	118,610	807	520
1957	806	20,870	5,050	18,170	144,560	864	730
1958	1,174	27,611	5,700	26,280	194,840	900	…
1959	1,479	37,000	6,100	31,400	200,000	1,130	…
1960	1,840	…	4,900	…	…	920	…
1961	634	…	3,300	…	…	700	…
1962	1,000	…	3,500	23,920	…	480	…
1963	1,101	33,216	4,600	27,175	300,960	510	805
1964	1,209	…	5,100	…	…	1,030	…
1965	1,792	…	6,400	…	…	1,460	…
1966	2,044	…	6,700	…	…	1,710	…
1967	…	…	5,500	…	…	1,900	…
1968	2,412	…	6,000	…	…	1,900	…
1969	3,026	…	6,600	…	…	1,700	…
1970	3,640	…	7,500	…	…	1,790	…
1971	4,030	…	7,200	…	401,280	1,890	…
1972	4,300	…	7,300	…	…	1,870	…
1973	4,859	…	7,600	…	…	2,230	…
1974	…	…	7,600	65,220	…	2,190	…

TABLE B-4.—CHINA: GROSS VALUE OF INDUSTRIAL AND HANDICRAFT OUTPUT, BY PRODUCER AND CONSUMER GOODS, 1949–57

[In millions of 1952 yuan]

	1949	1950	1951	1952	1953	1954	1955	1956	1957
Total industrial production [1]	14,020	19,120	26,350	34,330	44,700	51,970	54,870	70,360	78,390
Producer goods [1]	3,730	5,650	8,500	12,220	16,680	19,990	22,890	32,040	37,940
Consumer goods [1]	10,290	13,470	17,850	22,110	28,020	31,980	31,980	38,320	40,450
Industry [2]	10,780	14,060	20,210	27,020	35,580	41,510	44,750	58,660	65,020
Producer goods [3]	3,100	[4] 4,690	[4] 7,330	10,730	14,670	17,580	20,580	29,170	[5] 34,330
Consumer goods [3]	7,680	[4] 9,370	[4] 12,880	16,290	20,910	23,930	24,170	29,490	[5] 30,690
Handicrafts [1]	3,240	5,060	6,140	7,310	9,120	10,460	10,120	11,700	13,370
Producer goods [6]	630	[4] 960	[4] 1,170	1,490	2,010	2,410	2,310	2,870	3,610
Consumer goods [6]	2,610	[4] 4,100	[4] 4,970	5,820	7,110	8,050	7,810	8,830	9,760

[1] State Statistical Bureau, "Ten Great Years," Peking, 1960, pp. 16 and 87.

[2] Total industrial production less handicrafts.

[3] State Statistical Bureau, "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet "Kuan-yu 1956 nien-tu kuo-min ching-chi chi-hua chih-hsing chieh-kuo ti kung-pao" ("Communique on Results of Implementation of the 1956 Economic Plan") released Aug. 1, 1957, Peking, no publication date, pp. 28–29 except as noted.

[4] Handicraft and industrial production of producer and consumer goods are derived by forcing interpolated values to add to the total value of producer and consumer goods and of industry and handicrafts, respectively.

[5] Producer and consumer goods are derived as 52.8 percent and 47.2 percent of industrial production respectively. See State Statistical Bureau, "Communique on Fulfillment and Overfulfillment of China's First Five-Year Plan" NCNA-English, Apr. 13, 1959; in American Consulate General, Hong Kong, "Current Background" No. 556, Apr. 15, 1959, p. 4,

[6] Handicraft production of producer and consumer goods are total production less production by industry alone, respectively, except as noted.

TABLE B-5.—CHINA: GROSS VALUE OF INDUSTRIAL AND HANDICRAFT OUTPUT, INCLUDING AND EXCLUDING REPAIR, BY PRODUCER AND CONSUMER GOODS, 1956

[In millions of 1952 yuan]

	Total, including repair [1]	Repair	Total, excluding repair [2]
Total	70,360	[3] 1,189	69,171
Industry	58,660	[4] 917	57,743
Producer goods	29,170	[4] 917	28,253
Consumer goods	29,490		29,490
Handicrafts	11,700	[5] 272	11,428
Producer goods	2,870	[5] 272	2,598
Consumer goods	8,830		8,830

[1] Table B-4.

[2] Derived as total less repair.

[3] Derived as the sum of repair in industry and handicrafts.

[4] Table B-6. The entire value is assumed to be repair of producer goods.

[5] Estimated on the assumption that repair was 2.32 percent of the value of handicraft production. This percent is the share of employment in handicraft repair in 1954. See John Philip Emerson, "Nonagricultural Employment in Mainland China: 1949–58," U.S. Bureau of the Census, series P-90. No. 21, Washington, D.C., 1965, p. 116. The entire value is assumed to be repair of producer goods.

TABLE B-6.—CHINA: GROSS VALUE OF INDUSTRIAL OUTPUT, BY BRANCH, 1952–57

[In millions of 1952 yuan]

	1952	1953	1954	1955	1956	1957
All industry	27,014	35,577	41,513	44,748	58,661	65,020
Electric power	431	513	616	699	928	1,105
Coal	830	890	1,080	1,280	1,510	[1] 1,826
Petroleum	207	316	425	533	650	1,002
Ferrous metals	1,366	1,865	2,319	2,883	4,113	5,202
Metal processing	2,852	4,407	5,351	5,749	9,353	10,500
Machine building	[1] 1,423	2,219	2,719	3,035	5,764	6,177
Producer goods [2]					5,361	....
Consumer goods [2]					403	....
Metal products [3]	991	1,545	1,892	1,986	2,672	3,273
Repair [3]	438	643	740	728	917	1,050
Chemical processing	1,123	[1] 1,632	[1] 2,147	[1] 2,340	[1] 3,652	4,291
Building materials	621	919	976	991	1,475	1,626
Timber	1,216	1,541	1,743	1,485	1,718	1,951
Paper	655	711	844	983	1,318	1,691
Textiles	8,016	9,885	11,135	10,754	13,049	12,419
Producer goods [4]	1,124	1,167	1,275	1,903	1,895	....
Consumer goods [4]	6,892	8,718	9,860	8,851	11,154	....
Food processing	6,105	[1] 8,083	[1] 9,522	[1] 10,574	[1] 11,764	13,264

Source: John Philip Emerson, "Nonagricultural Employment in Mainland China: 1949–58," U.S. Bureau of the Census, series P–90, No. 21, Washington, D.C., 1965, p. 208, except as noted.

[1] Robert Michael Field, "The Growth of Industrial Production and Productivity in Communist China: 1952–57" (doctora thesis, Harvard University), 1966, pp. 156–159.

[2] Producer goods and consumer goods were derived as 93 and 7 percent of machine building, respectively. See Chao I-wen, "Hsin chung-kuo ti kung-yeh" ("The Industry of New China)", Peking, 1957, p. 43.

[3] For 1952, the following percentage distribution for the gross value of the metal processing sector was reported in State Statistical Bureau, "Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi" ("Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile and Paper Industries—Past and Present)", Peking, 1958, p. 112; Machine building, 49.9; Metal products, 33.3; Repair, 14.7. The 3 components do not add to 100, but the gross value of the machine building industry is 49.9 percent of the total. The gross value of metal products and repairs in 1952 was estimated by dividing the residual in proportion to the reported percentages. The gross value of repair in 1957 is estimated to have fallen to 10 percent of the metal processing sector. The gross value of metal products in 1957 is derived as a residual. The gross value for the intervening years was estimated from a linear interpolation of the relative shares of metal products and repair in 1952 and 1957.

[4] State Statistical Bureau, op. cit., pp. 164–165.

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TABLE B-7.—CHINA: GROSS VALUE OF TOTAL INDUSTRIAL OUTPUT, BY PRODUCER AND CONSUMER GOODS, 1957–74

[In millions of 1952 yuan]

	Total	Producer goods	Consumer goods
1957	78,390	37,940	40,450
1958	131,000	77,000	54,000
1959	182,000		
1964	127,662		
1965	153,194	81,164	72,030
1966	184,078		
1968	158,786		
1969	209,416		
1970	257,427	143,128	114,299
1971	294,420		
1972	319,609	198,000	121,609
1973	351,672	217,902	133,770
1974	369,256	227,768	141,488

NOTES AND SOURCES

Total:

1957: State Statistical Bureau, "Ten Great Years," Peking, 1960, p. 87.

1958: Derived as the sum of producer goods and consumer goods.

1959: Derived from the 1958 total and the reported increase of 39.3 percent. See "Press Communique on the Growth of China's National Economy in 1959," Peking, 1960, p. 1.

1964: Derived from the 1965 total and an estimated increase of 20 percent. This increase is consistent with data for 10 provinces. Most of the data are for less than the full year and many are above 20 percent. The increase is also consistent with the statement that the gross value of industrial output in 1974 was 190 percent over that of 1964. See Chou En-Lai, "Report on the Work of the Government," "Peking Review," Jan. 24, 1975, p. 22.

1965–66 and 1968–73: Robert Michael Field, Nicholas R. Lardy, and John Philip Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–73," U.S. Department of Commerce, forthcoming.

1974: Derived from the 1973 total and an estimated increase of 5 percent. This increase is consistent with the provincial data presented in table 5 and with the statement in Chou En-lai's "Report on the Work of the Government." See the entry for 1964.

Producer and consumer goods:

1957–58: State Statistical Bureaul Loc. cit. The reported figures for 1958 were converted from 1957 to 1952 yuan.

1965: The value of consumer goods was derived from the statement that "output value . . . has nearly doubled in the 9-year period starting from 1966 and the average increase during this period was double that for the previous 16 years" (See FBIS, Dec. 27, 1974, E8), and the assumption that increase from 1973 to 1974 was the same as the average increase from 1965–1974. If X stands for the value of output, then

$$\frac{X_{74}-X_{65}}{9}=2\left[\frac{X_{65}-X_{49}}{16}\right]$$

and

$$X_{74}-X_{73}=\frac{X_{74}-X_{65}}{9}$$

Since X_{49} equals 10,290,000,000 yuan, and X_{73} equals 133,770,000,000 yuan, the solution of the equations yields

$$X_{65}=72{,}030$$

and

$$X_{74}=141{,}488$$

These figures for 1965 and 1974 are consistent with the statement that the value of output nearly doubled. The value of producer goods was derived as the residual.

1970: Derived from the value of producer and consumer goods in 1949 (see Table B-4) and the statement that heavy and light industry in 1970 were 38 and 11 times 1949, respectively (see "T' an-t'an tseng-ch'an chieh-yueh," Shanghai, 1974, p. 7). The derived figures were forced to equal the total; as a result, the figures in the table are 38.4 and 11.1 times 1949, respectively. It is assumed that heavy and light industry refer to producer goods and consumer goods in this context.

1972: The value of consumer goods was derived from the 1973 total and the reported increase of 10 percent (see FBIS, Feb. 4, 1975, E9). The value of producer goods was derived as the residual.

1973: The value of consumer goods was derived from the 1949 total (see table B-4) and the statement that output in 1973 was "a dozen times" that of 1949 (see FBIS, Sept. 25, 1974, E6). The characters used in the original are not available, but a dozen times is frequently used to translate "shih-chi-pei," which could mean 12 to 13 or 14 times. In this instance, 13 times the 1949 figure was used. The value of producer goods was derived as the residual.

1974: See the entry for 1965.

TABLE B-8.—CHINA: REPORTED AND ESTIMATED GROSS VALUE OF INDUSTRIAL OUTPUT, BY REGION, 1952, 1957, 1965, AND 1970

[In millions of 1952 yuan]

Region	1952	1957	1965	1970
National total	34, 330	78, 390	153, 194	257, 427
Northeast	7, 740	18, 081	34, 233	52, 585
North	7, 297	17, 752	38, 334	71, 652
East	10, 837	21, 297	43, 380	71, 522
Central	2, 200	5, 840	10, 913	20, 219
South	2, 502	5, 834	11, 459	18, 720
Southwest	2, 362	6, 576	10, 980	14, 184
Northwest	893	2, 409	3, 895	8, 289

Note: Components may not add to the total because of rounding. For those provinces for which the gross value of industrial production was not reported or could not be derived, estimates were made by the method described in the source cited.

Source: Robert Michael Field, Nicholas R. Lardy, John Philip Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949-73," U.S. Department of Commerce, forthcoming.

APPENDIX C

THE CALCULATION OF INDEX NUMBERS FROM INCOMPLETE DATA [23]

I. Introduction

In economics, the measurement of changes in output over time on the basis of incomplete data is a nearly universal problem: observations from some series are almost always missing. Soviet economic data, for example, are more complete for the last year of a 5-year plan period than for other years; in the United States, data are more complete for years in which a census of manufactures has been taken; and in some less developed countries, data are published only sporadically. The problem is how to calculate index numbers that squeeze the most information out of the data that are available.

Procedures to calculate index numbers from incomplete data that were devised by Kaplan and Moorsteen in 1960 [24] and by Field in 1974 are described in sections II and III, respectively. The Field index is a generalization of the Kaplan-Moorsteen method. To make the two procedures clear, indexes are calculated from the hypothetical data presented in table C-1.

TABLE C-1.—HYPOTHETICAL DATA FOR ILLUSTRATIVE CALCULATIONS

Series number	Price	Output series 1	2	3	4	5	6	7
A	21	95	85			190		
B	17	118	177	236	295	354	324	
C	87	23				46		56
D	43	47	56	65	75	84	94	103
E	24	83	103	124	145	166	186	207
F	4	503	402	477		729	804	855

II. The Kaplan-Moorsteen Index

In their work on Soviet industry, Kaplan and Moorsteen devised an ingenious method for dealing with the problem of incomplete data. They defined three indexes, as follows:

A *benchmark index* is a Laspeyres index calculated for all years in which output data are available for every commodity. In the sample problem, the benchmark index is calculated for years 1 and 5.

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[23] Reprinted from Robert Michael Field, Nicholas R. Lardy, and John Philip Emerson, *A Reconstruction of the Gross Value of Industrial Output in the People's Republic of China: 1949–73*, U.S. Department of Commerce, forthcoming.

[24] Norman M. Kaplan and Richard H. Moorsteen, *Indexes of Soviet Industrial Output*, Santa Monica, 1960, pp. 61–68.

An *interpolating index* is a Laspeyres index calculated for the years between benchmark years. It is based on those commodities for which output data are available in every year. A separate index is calculated between each successive pair of benchmark years. In the sample problem, the interpolating index is calculated from output series B, D, and E.

An *extrapolating index* is a Laspeyres index calculated for the years after the last benchmark year. It is based on those commodities for which output data are available in every year. In the sample problem, the extrapolating index is calculated from output series D, E, and F.

The Kaplan-Moorsteen index for the years between benchmark years is calculated recursively from these indexes according to the formula:

$$KM_t=\left(\frac{1+\alpha}{1+\beta}\right)\left(\frac{I_t}{I_{t-1}}\right)KM_{t-1}$$

where I is the interpolating index, and α and β are the average annual rates of growth of the benchmark and interpolating indexes, respectively. The procedure for extrapolation is analogous.

Indexes calculated by the Kaplan-Moorsteen method from the sample data are presented in table C–2. The final index has two desirable properties: The year-to-year pattern of change is the same as that shown by the interpolating and extrapolating indexes, and the average annual rates of growth between benchmark years are the same as those shown by the benchmark index. However, the index does not make use of all the data that are available. The interpolated portion of the index does not make use of series A or F, and the extrapolated portion does not make use of series B or C.

TABLE C–2.—THE KAPLAN-MOORSTEEN INDEX

Year	Benchmark index	Interpolating index	Extrapolating index	Final index
1	100.0	100.0	100.0	100.0
2		131.1		127.7
3		162.5		154.3
4		194.7		180.1
5	203.9	226.2	174.5	203.9
6			194.6	236.4
7			212.7	269.0
Rate of growth	19.5	22.6	14.9	

III. The Field Index

How can the information not used in the interpolating and extrapolating indexes be captured in an aggregate index? Recasting the form of the Kaplan-Moorsteen index gives an insight into the problem. If the index for the base year is KM_o, then the index for the *jth* year is:

$$KM_j=\left(\frac{1+\alpha}{1+\beta}\right)^j\left(\frac{I_j}{I_o}\right)KM_o$$

and the relationship between the years j and i is:

$$\frac{KM_j}{KM_i}=\left(\frac{1+\alpha}{1+\beta}\right)^{j-i}\left(\frac{I_j}{I_i}\right)$$

But the ratio I_j/I_i is based only on those series that are complete and does not necessarily take full advantage of all the data that are available.

The best statement of the relationship between output in the years j and i is the link relative:

$$r_{ij}=\frac{\sum_{k=1}^{n}\delta P_kQ_{jk}}{\sum_{k=1}^{n}\delta P_kQ_{ik}}$$

where P and Q are price and quantity, respectively, n is the number of output series, and δ is an indicator function. The function is defined as:

$$\delta = \begin{matrix} 1 \text{ if both } Q_{ik} \text{ and } Q_{jk} > O \\ 0 \text{ if either } Q_{ik} \text{ or } Q_{jk} \leq O \end{matrix}$$

The link relative r_{ij} is the ratio of the output of those commodities for which output data are available both in year i and in year j.

The Field index is calculated between successive benchmark years from a complete set of link relatives. First, because the series for which output data are available may not be growing at the same rate as aggregate output, the link relatives are adjusted in a manner analogous to that used by Kaplan and Moorsteen to adjust their interpolating index. The adjusted link relative is:

$$R_{ij} = \left(\frac{1+\alpha}{1+\gamma_{ij}}\right)^{j-i} r_{ij}$$

where α and γ_{ij} are average annual rates of growth. Specifically, if years g and h are benchmark years,

$$1+\alpha = \left[\frac{\sum_{k=1}^{n} P_k Q_{hk}}{\sum_{k=1}^{n} P_k Q_{gk}}\right]^{\left(\frac{1}{h-g}\right)}$$

and

$$1+\gamma_{ij} = \left[\frac{\sum_{k=1}^{n} \delta P_k Q_{hk}}{\sum_{k=1}^{n} \delta P_k Q_{gk}}\right]^{\left(\frac{1}{h-g}\right)}$$

where

$$\delta = \begin{matrix} 1 \text{ if both } Q_{ik} \text{ and } Q_{jk} > O \\ O \text{ if either } Q_{ik} \text{ or } Q_{jk} \leq O \end{matrix}$$

α is the rate of growth for all commodities between benchmark years g and h, and γ_{ij} is the rate of growth of those commodities for which output data are available both in year i and in year j. α has to be calculated only once, but γ_{ij} must be calculated separately for each link relative.

Finally, the index $\hat{Y}_t$ is estimated by least squares from the following equation:

$$\frac{\hat{Y}_j}{\hat{Y}_i} = R_{ij} \cdot \epsilon_{ij}$$

Taking the logarithms of both sides of the equation yields:

$$\log \hat{Y}_j - \log \hat{Y}_i - \log R_{ij} = \log \epsilon_{ij}$$

The sum of the squares of $\log \epsilon_{ij}$ is minimized, subject to the constraint that the estimated index equals the benchmark index in benchmark years. If years g and h are benchmark years, minimize

$$\sum_{i=g}^{h} \sum_{j=i}^{h} (\log \hat{Y}_j - \hat{Y}_i - \log R_{ij})^2$$

subject to

$$\log \hat{Y}_g = \log Y_g$$

$$\log \hat{Y}_h = \log Y_h$$

where Y_g and Y_h are the values of the benchmark index in years g and h. The partial derivatives of the objective function are a system of simultaneous linear equations whose solution is the Field index.

The equations for estimating the Field index between years 1 and 5 of the sample problem are as follows:

$$\begin{bmatrix} 8 & -2 & -2 & -2 & -2 & 1 & 0 \\ -2 & 8 & -2 & -2 & -2 & 0 & 0 \\ -2 & -2 & 8 & -2 & -2 & 0 & 0 \\ -2 & -2 & -2 & 8 & -2 & 0 & 0 \\ -2 & -2 & -2 & -2 & 8 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} \log \hat{Y}_1 \\ \log \hat{Y}_2 \\ \log \hat{Y}_3 \\ \log \hat{Y}_4 \\ \log \hat{Y}_5 \\ \hat{\lambda}_1 \\ \hat{\lambda}_2 \end{bmatrix} =$$

$$\begin{bmatrix} -2 \log R_{12} - 2 \log R_{13} - 2 \log R_{14} - 2 \log R_{15} \\ +2 \log R_{12} - 2 \log R_{23} - 2 \log R_{24} - 2 \log R_{25} \\ +2 \log R_{13} + 2 \log R_{23} - 2 \log R_{34} - 2 \log R_{35} \\ +2 \log R_{14} + 2 \log R_{24} + 2 \log R_{34} - 2 \log R_{45} \\ +2 \log R_{15} + 2 \log R_{25} + 2 \log R_{35} + 2 \log R_{45} \\ \log Y_1 \\ \log Y_5 \end{bmatrix}$$

The procedure for extrapolation is analogous to that described above for interpolation. However, two points should be noted. First, if there are more than 2 years for which the data are complete, the selection of the benchmark years on which to base the adjustment of the link relatives offers a choice. It would seem logical that one benchmark should be the last complete year, but the selection of the other is arbitrary, and the year selected may affect the rate of growth shown by the index. Second, adding output data for a subsequent year may change the index numbers for the years since the last benchmark. Because the original estimate was based on incomplete data, and because the output data for the additional year give new information against which to judge performance in the earlier years, the result is reasonable.

The Field index calculated from the sample data is presented in table C–3 and compared with the Kaplan-Moorsteen index. The Field index has several desirable properties in addition to using all of the data. First, if the data are complete, the index is the same as a Laspeyres index. Second, if some of the series are missing but the remaining series are complete, the index is the same as the Kaplan-Moorsteen index. Third, the index can be calculated even if there are no series that are complete. And last, the index can be calculated without complete data for benchmark years. If there are not 2 benchmark years, the index can be derived from the unadjusted link relatives.

TABLE C-3.—ALTERNATIVE INDEXES CALCULATED FROM HYPOTHETICAL DATA

Year	Field index	Kaplan-Moorsteen index
1	100.0	100.0
2	116.4	127.7
3	145.3	154.3
4	173.4	180.1
5	203.9	203.9
6	218.5	236.4
7	256.0	269.0

CHINA'S INDUSTRIAL SYSTEM

By Thomas G. Rawski

I. Introduction

China's achievements in such diverse areas as nuclear weaponry, satellite technology, rural electrification, chemical fertilizer production and most recently, petroleum development illustrate the significance of industrial advance since 1949. Although the paucity of statistical information leads to differences among various estimates of industrial growth, all observers agree that output of factories, mines, and utilities has advanced at a rapid, though decelerating pace since 1949. My own studies indicate that in terms of 1952 prices, the average annual growth rate of industrial gross output value since 1952 falls within the range of 12 to 14 percent.[1] China's achievements compare favorably with industrial performance in other large developing nations such as Brazil and India, particularly since these countries have enjoyed freer access to foreign assistance, expertise and technology than has the People's Republic.

This impressive record raises many questions about the nature and evolution of industrial planning and factory management in the People's Republic. Who formulates annual plans? What relations exist among workers, factory executives and economic planners? What changes have occurred in industry since the 1950's? Could China benefit from the type of economic reforms which have recently appeared in the European socialist countries? This essay approaches these issues by discussing the origins of China's industrial system, its evolution since the early 1950's, and the efficiency of industrial operations.[2]

II. The Spread of State Control and Production Planning

China's system of industrial planning was not born overnight. The spread of central economic control was a gradual process, and it is only with the ratification of China's First Five-Year Plan (FFYP) in mid-1955, over 2 years after its formal beginning in January 1953, that we can begin to speak of an integrated industrial system and policy rather than collections of ad hoc production orders and investment projects.

[1] Thomas G. Rawski, "Chinese Industrial Production, 1952–1971," *Review of Economics and Statistics* 55.2 (1973), pp. 169–181. The use of a later price base would lower the estimated growth rate, but changing from gross to net output would raise the rate of growth. For alternative estimates of industrial growth, see Robert M. Field's contribution to this volume.

[2] Previous studies of China's industrial system include Ishikawa Shigeru, *Chūgoku ni okeru shihon chikuseki kikō* (The Mechanism of Capital Accumulation in China) (Tokyo, 1960); Audrey Donnithorne, *China's Economic System* (London, 1967); papers by Kang Chao and Dwight H. Perkins in Alexander Eckstein et al. eds., *Economic Trends in Communist China* (Chicago, 1968); Barry M. Richman, *Industrial Society in Communist China* (N.Y., 1969) and Christopher Howe, *Wage Patterns and Wage Policy in Modern China, 1919–1972* (Cambridge, England, 1973).

As the victorious Red armies swept southward in 1949, China's new leaders sought to revitalize industry under a Soviet-inspired system of state ownership, central planning, and responsive enterprise leadership. Expropriation of enterprises formerly administered by the Kuomintang government placed leading producer enterprises, including Japanese-built plants, in Government hands. In the consumer sector, compulsory procurement contracts maintained state control over privately owned factories until they were nationalized in 1956.

In the sphere of planning and management, however, the paucity of expert personnel and of reliable information severely limited the rate of progress. Unavoidable initial confusion was heightened by the regime's determination to begin new construction without waiting for normal production to resume at plants which had escaped severe wartime damage. As thousands of workers were added to industry's payrolls, the competing demands of rebuilding, innovation, and expansion piled new strains on an already overextended corps of skilled and experienced personnel.[3]

Faced with the impossibility of asserting close control over an industrial sector which soon included 10,000 state enterprises, several million employees and thousands of construction projects, Peking concentrated its initial efforts on key commodities, enterprises, and regions. As one area, product, or unit developed adequate managerial competence, economic administrators directed their energies elsewhere.

Growing control was most evident in the iron and steel sector, where rationalization was facilitated by the small number of firms and by the technology of metallurgy, which permits unskilled workers to perform a variety of duties under the direction of a few trained engineers. First priority went to the iron and steel works at Anshan, China's premier industrial facility, and to the nearby steel center at Pench'i. Chinese managers developed forms of teamwork which reduced the importance of individual skills. Captured Japanese personnel prepared detailed manuals which enabled ordinary shophands to work without close supervision. Imaginative innovations enabled even the least trained workers to operate delicate machinery.[4]

Rapid increases in output, labor productivity and in the accuracy of production plans followed these reforms. By 1952, the authorities could turn their attention to smaller steel plants at Chungking, Talien, Tayeh, T'angshan and elsewhere, which suffered from disorganization, poor quality control, neglect of maintenance and other elementary problems already eliminated at Anshan and Pench'i. Once again, reforms led to rapid improvements in performance.

In the machinery industry, creation of a system combining detailed central planning with competent and responsive enterprise management proved far more difficult. In comparison with metallurgy, engineering is characterized by numerous producers, a complex and shifting output mix and a technology which requires a series of technically exacting operations including design, casting, forging, machining, assembly, and inspection for thousands of different machine parts. In

[3] Shanghai Machine Tool Plant lost 60 percent of its technical staff during 1953–54, while the East China Bureau of the Ministry of Heavy Industry transferred 70 percent of its technical cadres to construction units at about the same time. See *Jen-min jih-pao* (People's Daily, Peking, hence JMJP), Oct. 30, 1955, and *Ta-kung pao* (L'impartial, Shanghai), Jan. 3, 1953.

[4] *Chūkyō tekkōgyō chōsa hōkoku sho* (Survey Report on Communist China's Iron and Steel Industry) (Tokyo, 1955), I, 165, 180, 245.

trying to develop planned machinery production, Chinese officials confronted technical conditions which had been "a source of great difficulty" to American mobilization plans during the First World War.[5]

As in steel, economic planning began with key products, regions, and enterprises. Again, outstanding progress was reported in the Northeast (formerly Manchuria), but the national picture was not bright. A 1954 editorial noted that enterprises outside the control of the First Ministry of Machine-building (FMMB), the authority responsible for major products of civilian machinery, lacked unified direction; eliminating their tendency toward "blind development" would take "a long time."[6]

Even within its restricted scope of operation, the ministry found it difficult to prepare prompt, comprehensive, and accurate plans for the 91 firms under its control. A 1953 directive spoke of "utter confusion" in planning, technical and supply work, inspection and maintenance.[7] Frequent delays and changes in production plans continued in subsequent years: As late as 1957, the FMMB was singled out for criticism and urged to "balance its supply in a well-coordinated and unified way and work out an overall plan of production."[8]

Chronic tardiness, shifting targets, and complaints that plans were based on unreliable estimates and conjectures arose from weaknesses at the factory level as well as in Peking. Preoccupied with the daily demands of production, construction, labor training, and technical reform, factory officials could spare little attention for the task of compiling and transmitting the economic and technical data essential for smooth functioning of the planning system.[9]

Elsewhere, progress toward a Soviet-inspired plan system fell between the extremes represented by steel and machinery. Textiles and chemicals were two sectors in which detailed data comparing different factories enabled planners to pinpoint technical difficulties from an early date. Construction, on the other hand, remained intractable, with reports of delays, slipshod budgeting, disorganization, and cost overruns persisting throughout the 1950's.[10] As in the case of machinery, these problems arose in part from the nature of the industry: The unique features of each of many construction projects hampers close control of this sector in any economy.[11]

Despite these variations, the FFYP years saw the gradual development of a hierarchy of economic control stretching from Peking to the factory floor. The industrial ministries were increasingly able to translate centrally determined policies into effective action at the microeconomic level. The emerging system of industrial administration, which has survived without fundamental change to the present, is the subject of the following section.

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[5] Bernard M. Baruch, *American Industry in the War* (N.Y., 1941), p. 278.
[6] JMJP, Dec. 6, 1954.
[7] *Survey of the China Mainland Press* (hence SCMP) 610 (1953), p. 9.
[8] *Extracts from China Mainland Magazines* (hence ECMM) 90 (1957), p. 22.
[9] To cite one of many examples, a 1956 investigation discovered that officials at Chinan No. 1 Machine Tool Plant could not answer questions about the quantity of fixed capital, the turnover period for circulating funds, the number of machines in the plant or the volume of output per ton of raw materials. See Chiang Li, "Several Problems as Seen from Four Chinan Plants," *Chi-hsich kung-yeh* (Machinery, hence CHKY) 1 (1957), p. 31.
[10] Problems abounded even at key projects built with Soviet aid. The cost of enlarging Shenyang's No. 1 Machine Tool Plant, for example, turned out to be five times the initial estimate. See Pai Ou, "Brief Discussion of the Direction and Tasks of the Machinery Industry During the First and Second Five-Year Plans," CHKY 12 (1957), p. 5.
[11] Commenting on the American scene, David Novick et al., *Wartime Production Controls* (N.Y., 1949), p. 287 report that "no phase of industrial and civilian mobilization for war was the subject of as extended discussion and as consistently bad administration as was construction."

III. The Industrial System of the 1950's

China's industrial organization is a hybrid combining major features of Soviet institutions introduced during the 1950's with later modifications made in response to changing economic and political conditions. At the top stands the State Council, which holds formal responsibility for promulgating economic targets for all sectors. Once ratified by the State Council, economic plans carry the force of law, and failure to fulfill them is, technically speaking, illegal. In fact, detailed planning takes place in the State Planning Commission, which works in cooperation with the State Economic Commission, the State Statistical Bureau, the State Construction Bureau, the People's Bank, and other economic agencies subordinate to the State Council.

The State Council approves output plans for major commodities and value targets for various branches of industry. These norms are transmitted to the central government's industrial ministries—for coal, metallurgy, chemicals, textiles, etc.—which divide tasks and resources among constituent enterprises to ensure fulfillment of their portions of the national plan. Despite a gradual decentralization process beginning in 1957 which has transferred direct control of many industrial enterprises to the provinces and localities, this chain of authority has been an important feature of industrial administration since the creation of the first industrial ministries in 1952.

The fundamental unit of industrial activity is the enterprise. Each enterprise is headed by a director or manager. In addition to the technical functions of procurement, production, and sales work, directors enjoyed broad latitude over personnel and wage matters during the FFYP years. This system of "one-man management," based on Soviet practice, was subsequently challenged, and executive authority partially transferred to enterprise branches of the Communist Party. Party control reached a peak during the Great Leap Forward (1958–60), declined during the early 1960's, and may have rebounded under the Revolutionary Committees which have assumed nominal control of enterprise operations in the wake of the Cultural Revolution (1966–68).

The chief obligation of the firm, and of the managers and Party personnel occupying key posts, is to carry out the annual economic plans issued by the State Council and other organs of the central government. Despite periodic changes in the list of norms and in their relative importance, plan targets have always included figures for sales value and physical output of major commodities, financial quotas involving wages, costs, and profit, and subsidiary requirements concerning input coefficients, research, and innovation. Enterprises may also receive additional assignments such as expanding productive capacity, training workers for other firms and meeting special orders outside the current plan.

Enterprise plans typically emerge from consultations between factory executives and ministry officials. The center prepares preliminary drafts on the basis of overall policy objectives and the detailed information collected from below. Enterprise directors and more recently, workers, normally have an opportunity to discuss these draft plans and to suggest revisions before the final version is adopted. This bargaining process provides ample scope for enterprises to resist excessive output targets or to request additional materials, labor or equipment before accepting difficult assignments.

This summarizes the institutional framework of Chinese industry. Producers are subordinate to a dual network of control by Government and Party organizations (now complicated by the increasing role of provincial and local governments and their industrial and planning bureaucracies). Industrial units are charged with carrying out economic plans, but participate actively in their formulation. Within the enterprise, authority is shared among professional managers, engineers, Party personnel, and worker organizations. The relative strength of these groups is not constant, but has shifted with changes in the political and economic climate.

In theory, the aim of this planning system is to furnish each unit with precisely enough equipment, materials, labor, and working funds to allow plans to be met if all resources are deployed with maximum economy. If achieved, this goal of making each input a bottleneck for every unit maximizes output at the microeconomic level and simultaneously exposes the incompetence of managers who fail to meet the targets set for their units.

Chinese economic planning, however, falls far short of the ideal. Especially in the early years, planners lacked the detailed studies of average and marginal input-output coefficients needed to anticipate the effect of changing the resource mix allotted to each enterprise. Even for sectors which consume only a few basic raw materials, the persistence of large differences among firms and overtime in such technical data as the coke required to smelt one ton of pig iron makes it difficult to forecast movements of actual, let alone potentially attainable relations between supplies and output.[12] In addition, the accumulation of technical and managerial skills may cause further unpredictable shifts in input-output ratios. These limits to the exactness of industrial planning apply with added force in more complex sectors. The plethora of established, new, and modified machinery products, for instance, makes it virtually impossible to determine capital-output ratios or material requirements with any degree of precision.

Under these circumstances, Chinese industrial planning is necessarily a heavy-handed operation which can only aim to achieve rough consistency between input supplies and output targets for individual enterprises. This was particularly evident during the 1950's, when the inevitable confusion of early planning attempts was heightened by China's weak data base and by the paucity of trained and seasoned personnel.[13] Coupled with governmental determination to push for rapid industrial growth, these conditions led to frequent inconsistency between targets and resources.

When resources fall short of requirements, sharp conflict arises between industrial units and the state. The center's planning agencies and industrial ministries expect producers to complete all aspects of their plans with resources assigned them. Victims of egregious supply breakdowns and planning errors can hope for a sympathetic hearing in Peking, but in general, the state has no choice but to insist on the fundamental soundness of economic plans and to interpret noncompliance as evidence of managerial incompetence. Any other course would quickly destroy economic discipline.

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[12] *Chūgoku sangyō bōeki sōran* (Handbook of China's Industries and Trade) (Tokyo, 1963), pp. 126–27, shows variations of up to 19 percent in unit coal consumption among three groups of thermal powerplants. At one steelworks, average monthly consumption of metal per ton of steel ingot fluctuated by over 20 percent between May and December 1953. See "Why Issue Quotas for Consumption of Raw Materials Per Unit of Products?" *Chung kung-yeh t'ung-hsün* (Bulletin of Heavy Industry, hence CKYTH) 21 (1954), p. 38.

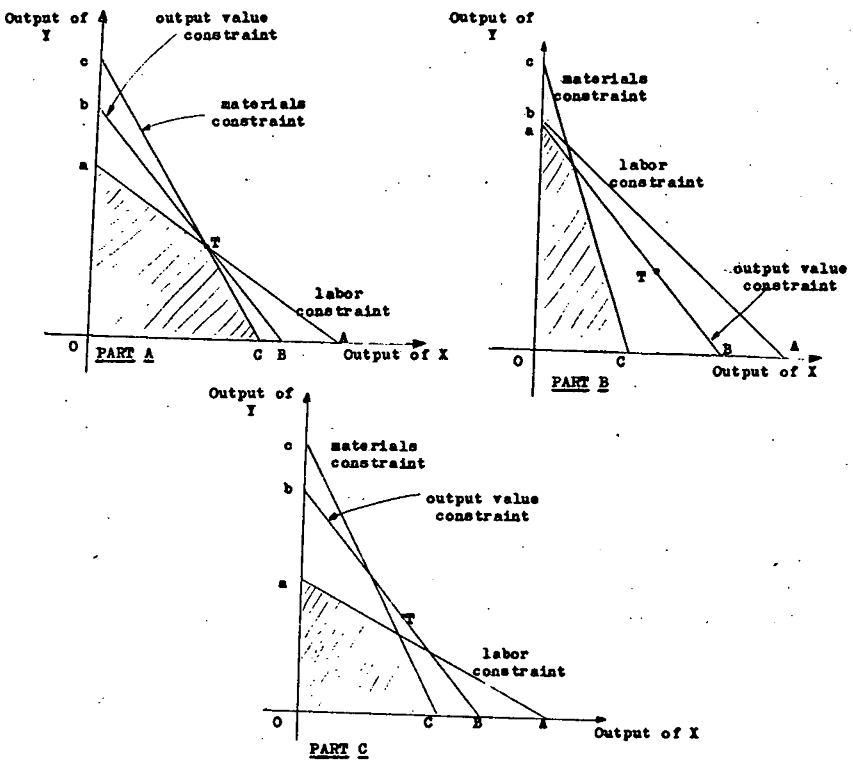
[13] These problems are analyzed in Choh-ming Li, *The Statistical System of Communist China* (Berkeley, 1962), part 1.

Figure 1 illustrates the position of an enterprise which uses two resources, materials and labor, to manufacture two products, X and Y. The planners' ideal is depicted in 1A. The target point T, which represents the quotas for output value and for physical production of X and Y, is the only feasible output configuration under which the firm can satisfy either the value or the assortment target. Since T lies on the production frontier aTC, the firm can reach T only with maximum economy of labor and materials.

From the firm's standpoint, this situation is not unsatisfactory. Although maximum economy is needed to attain T, the firm, through its role in negotiations preceding the ratification of its plan, has exercised some control over the technical standards hidden beneath the constraints shown in figure 1A. Since the firm's substantial bargaining position insures that these standards are not unreasonably demanding, T can probably be reached unless major supply disruptions or machinery breakdowns upset normal production.

Figures 1B and 1C illustrate less desirable outcomes. Here inadequate resources make it impossible to achieve the assortment goals (1B) or either the assortment or value targets (1C). These situations may arise if the firm fails to secure a feasible plan: Planners or factory executives may overestimate future productivity growth. Alternately, the center may raise plan targets or lower input supplies in the mistaken belief that the firm has attempted to conceal the full extent of its productive capacity.

FIGURE 1.—Schematic representation of plan targets and constraints.



NOTE.—Shaded areas denote attainable output combinations.

To maintain the fabric of national plans as well as their own career prospects, factory executives must maximize the probability that plans can be met even with unexpected shifts in the balance between output targets and means of production. In their effort to reduce the chance of failure, factory leaders embark upon a search for slack in their operating plans. This slack or excess capacity may consist of eliminating or relaxing certain plan targets or of increasing the volume of available resources.

Since all targets are compulsory and major inputs are, with few exceptions, limited to quotas furnished by the state, the creation of slack inevitably entails deception and concealment and often outright illegalities on the part of enterprise directors, engineers, accountants, and Party officials.[14]

This search for slack is not a random process. When confronted by inability to fulfill all targets, Chinese officials at all levels have tended to focus their efforts on quotas dealing with the total value of production and the quantity of physical output. Quality, cost, balance among product types and preparations for future production are of distinctly secondary importance, and are often neglected in the interest of guaranteeing the planned flow of output.

Disproportionate attention to output volume is deeply rooted in the Soviet system of economic planning adopted in China during the 1950's. The fundamental goal of "material balance planning" is to insure supplies of predetermined quantities of commodities needed at various points for current production, investment, consumption, and export. The primacy of output volume follows directly from this foundation. If sufficient quantities of goods are produced, the intended recipients of the missing products cannot meet their obligations, and the resulting disruption will reverberate through the entire economy. If, on the other hand, quantity targets are met by skimping on quality or variety, customers have little cause for complaint. Their task of meeting ambitious targets with less than ideal resources is not unusual in an economy perpetually straining to squeeze more output from limited means.

In any system based on physical commodity flows, leaders must be willing to accept high costs to avoid delay.[15] If these costs become unbearable, a general reduction in the pace of growth is needed. But so long as the pressure to raise output remains intense, exhortation alone will not suffice to direct managerial attentions toward cost, quality, assortment and other desirable, but secondary criteria.

These matters offer little mystery to Chinese economists:[16]

> Since the general indices of our government's plans and statistics are based on quantities, attention has thus been concentrated in these with little or no regard to quality in the distribution of missions and conducting of examinations on the part of responsible organizations on the upper level.

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[14] A scandal involving various forms of falsification on the part of managerial and Party personnel at Shenyang's Transformer Plant is reported in *Chūgoku shiryō geppō* (China Materials Monthly) 111 (1957), pp. 8–10.

[15] The rationality of paying heavily for promptness is a major theme of Robert C. Repetto, *Time in India's Development Programmes* (Cambridge, 1971). U.S. defense procurement uses systems "in which the control of time is often achieved at large costs in performance and money." See Carl Kaysen, "Improving the Efficiency of Military Research and Development," Public Policy 12 (1963), p. 254.

[16] SCMP 1446 (1957), p. 15, with emphasis added. Ishikawa, *Chūgoku ni okeru*, pp. 92–3 provides additional references on this point.

With Peking's eyes riveted on quantity, factory officials must follow suit. Frequently disputes between managers and inspectors reveal the institutional grounds for neglecting quality: [17]

Factory manager Chao demanded that inspector Li certify rejects to enable the plant to meet its output quota. Li refused. Chao then appointed Li assistant shop chief and ordered him to see that the plan was fulfilled. Li immediately changed his tune and demanded that the rejects be certified, but another conscientious inspector refused to give in and Chao's plan failed.

Rigidly enforced output quotas encourage a cycle of alternate slack and "storming" or "shock work" which is difficult to break. At the beginning of a new plan period, holidays and equipment repairs postponed during the hectic rush to complete the previous plan divert resources from current production, as does the need to replenish depleted stocks of materials and spares. When attendance, inventories, and equipment return to normal, it is already necessary to begin rushing to fulfill the next output target. As late as 1971, People's Daily took space to commend a Shanghai machinery plant for the seemingly exceptional feat of having "changed the situation of 'working slowly at the beginning of the year and working intensively at the year-end.' " [18]

Innovation is another frequent casualty of the drive to raise output. Research and experimentation require the attention of engineers and skilled workers whose services are also needed to maintain high levels of output. Complaints that "many enterprise leaders who are very concerned about plan fulfillment pay little attention to new product work" fall on deaf ears as long as quantity rules supreme.[19] Conflict between research and production persists. In 1971 at Shanghai's Hungch'i Shipyard,[20]

under the condition of the urgency of the task of production, there were some people, including some members of the basic level revolutionary committee, who said, "The task of production is already so heavy, where is there time for carrying out innovation?" There were even some who said, "The task of production is a 'hard target,' but the task of scientific research is a 'soft target.' "

In addition to selective neglect of targets, the firm can also lighten its task by increasing its stock of productive resources. Vertical integration and excess inventory accumulation illustrate this type of behavior.

With suppliers focusing their attention on raising output volume, it is not surprising to find numerous complaints of tardy deliveries, defective products, poor quality, incorrect specifications, and cost overruns in Chinese publications. Inspectors blamed the poor performance of Shenyang's Heavy Machinery Plant on tardy delivery of wooden molds.[21] Tientsin's Power Machinery Works received overweight, overpriced, and defective forgings.[22] Even the army found that its cranes failed to meet specifications and were dangerous to operate.[23]

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[17] *Kung-jen jih-pao* (Daily Worker, Peking), July 19, 1955.

[18] SCMP 4889 (1971), p. 21. American government agencies, universities and other organizations with rigid fiscal years experience similarly wasteful yearend rushing to disburse funds. John P. Miller, *Pricing of Military Procurements* (New Haven, 1949), p. 25 cites a typical example.

[19] "We Must Fulfill This Year's Plan for Trial Production of New Products," CKYTH 14 (1956), p. 14.

[20] SCMP 4839 (1971), pp. 56–57.

[21] "Several Measures for Strengthening Production and Technical Preparation at Shenyang Heavy Machinery Plant," CHKY 23 (1954), p. 4.

[22] Liu Pao-tung, "We Hope 444 Plant Can Turn Around and Save Metal Materials," CHKY 20 (1956), p. 25.

[23] *Ch'ang-chiang jih-pao* (Yangtze Daily, Wuhan), July 26, 1955.

Worst of all, suppliers behaved most selfishly precisely when their cooperation was most urgently needed—in the tense weeks preceding the close of annual and quarterly plan periods.

Under these conditions, managers seek to limit the reliance of their enterprises on outside suppliers by increasing the degree of vertical integration. From the firm's viewpoint, the benefits of integration are nearly costless. Investment funds, if available, bear no interest—only depreciation is charged; and even if integration raises production costs, quirks of China's accounting system may allow profit to rise simultaneously.[24]

Captive repair shops are especially prized. A well-stocked machine shop can repair defective equipment received from outside or retool existing machinery without major investment allocations. In addition, an underutilized repair shop and its staff provides a reserve capacity to be mobilized at yearend or to impress Peking with unscheduled output increases during periodic "production and economy" drives.

The articulation of the transport and exchange mechanism which accompanies industrialization implies that working capital needs, like integration, will decline as the economy advances. As in the case of integration, however, the levels of circulating funds observed in Chinese industry often exceed technical requirements. Industrial units use excess working funds to hoard labor, to finance unauthorized fixed investments and to maintain stockpiles of finished goods and semifabricates.[25] The most significant use of these funds, however, is to support widespread stockpiling of raw materials in excess of current requirements.

To build illegal stockpiles, managers "play it safe" by basing material requisitions on inflated input coefficients and concealing the resulting accumulation of inventories. In 1953, Anshan required 1.05 tons of metal to smelt one ton of steel ingot, but reported figures of 1.07 and 1.09 in the production and supply plans for that year.[26] Elsewhere, "insurance" of 2–6 percent was commonly added to supply requisitions.[27]

Despite institutional reforms and repeated inspections which rarely fail to unearth hidden stocks, demand continues to be swollen by the fictitious claims of would-be hoarders, with the result that scarcities of industrial supplies are worsened, and at times perhaps created by efforts to accumulate illicit inventories.

This system of organization and the deviations which it generates will make familiar reading to students of Soviet industry. In fact, Soviet cooperation and advice failed to shield the Chinese from any of the major problems of plan implementation which have plagued industry in the U.S.S.R. Weak quality control, neglect of innovation, excessive integration, stockpiling, and other problems appeared as nearly exact replicas of the prewar Soviet situation.[28]

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[24] Absence of interest charges on fixed capital is asserted by Donnithorne, *China's Economic System*, p. 437 and seems implicit in descriptions offered to recent visitors. Hsü I, "On Several Problems of Economic Accounting," *Ching-chi yen-chiu* (Economic Research) 4 1958), pp. 64, 72–3, shows how integration made Anshan's steel costs deceptively low.

[25] SCMP 1494 (1957), p. 8 describes a survey of 175 enterprises under six ministries which revealed excess working capital averaging 21.1 percent of actual requirements.

[26] JMJP, Feb. 17, 1953. T'angshan Steelworks tried a similar gambit in the following year ("Why Issue Quotas," p. 38).

[27] The 2–6 percent range is from "Why Issue Quotas," p. 39. Ch'eng Ch'i-hsing, "Opinions on Improving Material and Technical Supply Work," CHKY 24 (1956), p. 4, reported that 3.5 percent was the customary "insurance" figure for machinery plants.

[28] See David Granick, *Management of the Industrial Firm in the U.S.S.R.* (N.Y., 1954) and Joseph S. Berliner, *Factory and Manager in the U.S.S.R.* (Cambridge, 1957).

Studies of industry in the European socialist countries attribute these difficulties to a short-term, output-oriented managerial philosophy which results from rapid turnover of executive personnel and from their pursuit of substantial monetary premiums awarded for meeting certain plan targets.[29] But in China, similar management problems have appeared even though executive bonuses and mobility are far less important than in the U.S.S.R.[30] In explaining these common tendencies, we must therefore focus on the quantitative framework of industrial planning and on the tautness between targets and resources, characteristics shared by socialist industry in Europe and China, rather than on the personal circumstances of industrial executives.[31]

IV. Reforming the Industrial System

By 1957, Chinese industrial personnel had outgrown earlier naive expectations that Soviet institutions, advanced technology, and massive investment could rapidly eliminate all obstacles to industrialization. Reforms were needed, and with 8 years of experience, the Chinese felt prepared to strike out on their own. As Mao Tse-tung observed:[32]

> In economic work, dogmatism primarily manifested itself * * * in heavy industry and planning. Since we didn't understand these things and had absolutely no experience, all we could do in our ignorance was to import foreign methods. * * * Now the situation has changed.

Economic writers showed a growing awareness of industrial interdependence and of the resulting need to extend economic analysis beyond the broad aggregates discussed in the FFYP. The reality of technical and marketing difficulties at even the newest Soviet-built plants pinpointed the need to improve demand forecasting, an area almost entirely neglected before 1957.[33] Without careful microeconomic analysis, introduction of advanced production techniques often created undesirable side effects.

At the same time, growing information and technical resources made it possible to identify industrial problem areas and take concrete remedial steps. The progress of China's statisical system could be seen in the pages of newspapers and economic journals, which now used detailed comparisons of costs, materials consumption, quality, waste, inventories and productivity to ask "what is advanced, who is backward?" A newly emerging professional inspectorate, increasingly well trained and equipped, carried this approach to the factory floor.

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[29] Abram Bergson, *The Economics of Soviet Planning* (New Haven, 1964), chapter 5; Janos Kornai, *Overcentralization in Economic Administration* (Oxford, 1959), p. 122. David Granick, *The Red Executive* (Garden City, 1961), p. 112, cites studies of the 1930's showing that under 15 percent of Soviet managers held their posts for as long as 5 years.

[30] In 1966, Richman found that 58 of 74 persons at or above the level of shop chief had held their posts for at least 4 years (*Industrial Society*, p. 299). Bonuses for Chinese executives never approached Soviet levels, and even the extent to which Chinese managers and engineers were eligible to receive premiums is not clear. See Dwight H. Perkins, *Market Control and Planning in Communist China* (Cambridge, 1966), p. 121; Donnithorne, *China's Economic System*, pp. 208–10; Howe, *Wage Patterns*, pp. 121–27.

[31] Similar emphasis appears in David Granick, *Soviet Metal-fabricating and Economic Development* (Madison, 1967), chapter 7.

[32] Stuart Schram ed., *Mao Tse-tung Unrehearsed* (Harmondsworth, England, 1974), pp. 98–99.

[33] Officials at the new Soviet-aided Loyang Bearing Works complained that steel producers were not only unable to supply needed materials, but in some cases were unaware of the new plant's existence. See Wang Te-yuan, "Perceive the Conditions of Steel Supply," CHKY 9 (1957), pp. 29, 13. Similar problems arose at other new plants, including Anshan's Seamless Tube Mill, Wuhan Steel Corp., Shenyang No. 1 and No. 2 Machine Tool Plants, Ch'angch'un No. 1 Motor Vehicle Works and Harbin Electric Meter Plant.

Technical difficulties exposed by factory inspectors or visiting investigation teams were now referred to a growing array of research and design institutes attached to industrial ministries, universities and enterprises. Lack of experience and equipment initially confined many units to elementary inquiries, and some were attacked as paper organizations incapable of conducting research and existing only "because the ministry said so." Even so, reports of independent Chinese achievements in these years are not without merit, especially with regard to modifications needed to operate Soviet processes and equipment in China and in areas such as ferrous castings in which Soviet methods produced poor results.[34]

This confluence of deepening economic insight, a growing data base and rising technical capacity naturally inspired a wide variety of proposals for improving industrial operations. These suggestions, many of which were implemented during 1957, focused on a general tightening-up of the planning process (e.g. eliminating tardy plan formulation), added emphasis on product quality, customer service, and interunit cooperation, restraints on the growth of accumulation, higher priority for coastal and small-scale industry and sectoral investment shifts favoring raw materials and agricultural support production.[35]

These timely changes were swept away by the Great Leap Forward of 1958–60, a succession of campaigns which obliged industry to concentrate almost exclusively on raising output volume. Central controls over funds, manpower, and materials dissolved. Within enterprises, technicians, inspectors, and managers were shunted aside in favor of less conservative leaders who pushed for bold acceleration of production.

Despite long-run benefits from the research efforts and expanded industrial participation of these years, the Leap's overall impact on industry was strongly negative, as uncoordinated pursuit of higher output accentuated weaknesses already apparent in factory operations.

By 1960, the partial breakdown of normal planning and reporting procedures had greatly increased the need for industrial consolidation. To this was added the twin blows of Soviet technical withdrawal, which left key investment projects unfinished and threatened to disrupt supplies of petroleum and military goods, and of consecutive poor harvests, which signaled the need to sharply increase industry's support of agriculture. The demand shifts resulting from these setbacks transformed an unavoidable adjustment process into a crisis in which industrial collapse became a genuine possibility.

As the magnitude of these difficulties became clear, specialists temporarily eclipsed by Mao Tse-tung's personal intervention in economic decisionmaking gradually reasserted control over industrial administration. This group, whose supporters seem to have included such prominent individuals as Liu Shao-ch'i, Chou En-lai, Teng Hsiao-p'ing, Po I-po, Li Hsien-nien, Li Fu-ch'un, T'ao Chu, and Sun Yeh-fang, instituted reforms which went far beyond the changes proposed in 1957. Their policies, which begin to appear as early as 1959 and were forcefully applied beginning in 1961, are summarized in the

[34] Meng Chih-chien, "On Mechanization of Casting Shops," CHKY 13 (1957), pp. 5–8.

[35] Many of the proposals are described in Jan S. Prybyla, *The Political Economy of Communist China* (Scranton, 1970), chapter 7.

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famous and controversial "Seventy Articles Concerning Industrial Enterprises and Mines." [36]

The "Seventy Articles" required enterprises to submit detailed information on their capital stock, inventories and productive capacity, to curtail unauthorized construction, recruitment, and sales, and to develop programs for monitoring finance, resource consumption, productivity, cost, and quality—all signs of a new determination to exercise firm central control over industry. Emphasis on the "system of responsibility assumed by the factory superintendent under the leadership of the Party committee," the authority of specialist personnel in the fields of inspection, stock-taking and finance, and the instruction that political "study time should be cut down as far as possible" showed that Party personnel and political activity were to serve the needs of current production, rather than vice-versa.[37]

The authors of the new policies did not shrink from drastic measures. Unproductive resources were summarily dismissed from industry. Unqualified workers who had obtained factory positions during the Great Leap were ordered back to farming.[38] As monetary controls tightened, firms struggled to reduce costs and to avoid the injunction that "except with special instructions * * * losing concerns * * * should stop operation." [39]

The most important change was Peking's reversal of its earlier emphasis on output maximization. The new orders stipulated that "products that are not up to standard shall not be allowed to leave the factory." [40] The party journal Red Flag reiterated this directive, adding that "products that fail to come up to the quality standards * * * should not be included in the output index." [41]

Instructions to raise product quality had, of course, come from Peking before and had been widely ignored. This time, however, enterprises soon discovered that the center meant business. Tough enforcement was much in evidence. Some units were forced to suspend operations until quality standards could be met.[42] Efforts by Talien's High Pressure Valve Works to attribute substandard output to defects in the plant's equipment brought a curt rebuff from provincial and municipal authorities who ruled that unless the ministry's standards were met, output "would not be examined and accepted." Management finally promised to "adhere resolutely to the principle that accessories not conforming with standards should not be assembled, and final products not conforming with standards should not leave the factory." [43]

Similar confrontations occurred throughout industry. Inspectors pulled no punches: at Shanghai, high waste rates in iron castings were "due to the incompetence of the technical management." Once

[36] A summary of this unpublished document appears in *Documents of Chinese Communist Party Central Committee, September 1956–April 1969* (Hong Kong, 1971), I, 689–93.

[37] Ibid. The Party journal *Hung-ch'i* (Red Flag) emphasized that "technical problems must be decided on mainly by the technicians" (ECMM 314 (1962), p. 49).

[38] The number of workers and officials at the Shihchingshan Iron and Steel Plant rose from 12,000 in February 1958 to 52,000 in July 1960, but was reduced to about 31,000 by 1964. See M. Gardner Clark, *The Development of China's Steel Industry and Soviet Technical Aid* (Ithaca, 1973), pp. 17, 124.

[39] *Documents*, p. 689.

[40] *Ibid.*, 691.

[41] ECMM 295 (1962), p. 4.

[42] Thomas G. Rawski, "The Growth of Producer Industries, 1900–1971," in Dwight H. Perkins Ed., *The Chinese Economy in Historical Perspective* (Stanford, forthcoming), p. 229.

[43] Joint Publications Research Service (JPRS) 29161 (1965), pp. 55–6.

again, products "which have not been inspected are not allowed to go out of the factory. This regulation is being strictly enforced." [44]

With customers now expected to scrutinize incoming shipments for quality defects and even to send "representatives to the relevant production factories where they would take care of the inspection of products about to be delivered," producers found themselves obliged to heed the requirements of purchasing organizations.[45] Visits to customers gave production personnel a vivid understanding of the importance of quality. Employees of one Shanghai firm who had never seen their products in operation were dispatched to the mines to observe at first hand the damage wrought by their own inferior workmanship. Within 3 years, successful reforms had catapulted the same unit into national prominence as a cost and quality leader among manufacturers of pneumatic tools.[46]

These are not isolated examples. The considerable achievements of China's industries since 1960, a period in which imports comprised a small, and until recently, declining portion of available supplies of producer goods, could not have occurred without a general restructuring of managerial priorities.[47] Increased industrial support for agriculture, completion of projects abandoned by Soviet technicians, and massive output expansion in petroleum, chemical fertilizer, electronics, weapons, and other comparatively new industries involved thousands of enterprises and millions of workers. Progress in each of these fields presupposed careful attention to specification and workmanship which, as we have seen, was often absent prior to 1960.

The regional pattern of industrial advance lends further support to this view. If added investment were the chief source of recent industrial gains, older industrial centers which were excluded from the investment boom of the 1950's should be conspicuously absent from the cutting edge of technical advance.[48] In fact, the opposite is true. Technological leadership rests in China's older industrial centers, particularly Shanghai.

Shanghai is very much the hub of Chinese industry. Its preeminence is widely recognized, and the list of commodities in which Shanghai producers are national pacesetters runs the entire gamut of manufacturing. Machine tools, diesels, steel, bicycles, computers, cable, pumps, sewing machines, mining equipment, machinery for petroleum and fertilizer plants, transformers, and a wide range of consumer manufactures are among the areas in which, as one newspaper headline put it "The Nation Looks to Shanghai for Production Experiences." [49]

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[44] JPRS 29104 (1965), p. 40.

[45] ECMM 295 (1962), p. 4.

[46] Hu Pu-chou, "Establish Revolutionary Ambitions, Progress and Advance," CHKY 15 (1964), pp. 20–24.

[47] After allowing for inflation, the Central Intelligence Agency, *Foreign Trade in Machinery and Equipment Since 1952* (Washington, 1975), p. 6, estimates China's 1973 machinery imports to have been 1.4 percent above the 1957 level and 31 percent below the average for 1958–60. At the same time, *Peking Review* 48 (1972), p. 17, reports that domestic output of machinery (probably including military hardware) rose by 1,200 percent between 1957 and 1971 alone.

[48] Data compiled by Nicholas R. Lardy and myself indicate that Shanghai, which turned out 19 percent of national industrial output in 1957, received only three of more than 150 Soviet-aided projects and a mere 2.5 percent of overall investment outlays during 1953–57. Tientsin fared no better, gaining only a 7 percent increase in its machine tool stock during 1953–57, years in which gross fixed investment in industry amounted to over double the 1952 capital stock.

[49] JPRS 30743 (1965), pp. 23–25. For further discussion, see Thomas G. Rawski, "Problems of Technology Absorption in Chinese Industry," *American Economic Review* 65.2 (1975), pp. 324–28.

As qualitative considerations took on added importance in appraising industrial performance, older units substituted experience for capital equipment and outstripped newer enterprises to a degree which could not have occurred under the "output-first" rules of the 1950's. As one Chinese writer observed, with their "skilled veteran workers and experienced technical persons" and superior interenterprise cooperation, another legacy of the past, "old industrial bases and old enterprises * * * find it easier to tackle * * * complicated technical problems than new enterprises and new industrial bases." [50]

With the planning system in disarray after a 3-year lapse in central control, this shift toward new priorities was necessarily gradual, with reinstatement of expert personnel often a necessary preliminary. At the important Yung-li-ning Chemical Works, for example,[51]

> In arranging work for the technical workers, the factory leaders pay attention to exert the special skills of these workers, so that they can apply what they have learned * * * the deputy head of the education section, who has special experiences in the control of technical materials * * * is now, based on his special knowledge and the needs of technical work developments, transferred back to the control of technical materials.

Lower-level opposition to the reversal of Great Leap initiatives may explain the delayed response of some units to new instructions: T'aiyuan Chemical Works did not begin efforts to eliminate financial losses until late 1962, and neither quality upgrading at Shenyang No. 1 Machine Tool Works nor financial reforms at Peking's Boiler Works began until 1963.[52]

One sign of growing compliance was the confidence with which Peking supported wage and bonus systems based on individual piece rates. In December 1961, Anshan's No. 2 Steel Plant reported that "at the grand judgment at the end of the month, based on the accumulated units for each individual, (the leadership) determines the grades of superiority and awards them each with different grades of material rewards." [53] Since past experience had shown that these policies gave workers an incentive to raise output at the expense of quality, they would not have been brought forward unless factory officials and shop chiefs were prepared to enforce the desired stress on quality rather than volume.[54]

As qualitative concerns took root throughout industry, Peking showed a growing willingness to substitute indirect evaluation in place of detailed regulation of production, investment, resource allocation, and research. The advantage of this system, which lent credence to subsequent allegations that economic policy had "placed profit in command" was described as follows: [55]

> whether or not an enterprise returns its loan to the bank * * * is a very good yardstick for measuring its operations management and economic accounting. If an obstacle has been encountered at any of the links of production and circula-

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[50] SCMP 3275 (1964), pp. 4–5.

[51] JPRS 11719 (1961), p. 43. See also Stephen Andors, "Factory Management and Political Ambiguity, 1961–63," *China Quarterly* 59 (1974), pp. 443–48.

[52] "Persist in Revolutionary Thought, Force Yourself to the Highest Attainable Level," *Hua-hsüeh kung-yeh* (Chemical Industry) 9 (1964), p. 6; "How We Test and Accept Technical Management Reorganization Work," CHKY 8 (1963), p. 14; JPRS 28891 (1965), pp. 57–59.

[53] JPRS 12332 (1962), p. 38. See also Howe, *Wage Patterns,* pp. 122–23 and Andors, "Factory Management," pp. 459–61.

[54] The adverse effect of piece rates on quality is discussed in Ch'u Hsüeh, "Inquiry Into the Problem of Piece-Work Wages," *Ts-ai-cheng yen-chiu* (Fiscal Research) 6 (1958), pp. 49–52 and Chu Wen-wu et al, "Why Does Shanghai Diesel Engine Plant Eliminate Piece Rates During the Great Leap Forward," *ibid.,* 7 (1958), pp. 22–24.

[55] ECMM 209 (1962), p. 12, with emphasis added.

tion, it will be reflected here. Such a method of inspecting * * * an enterprise *is simple and direct and can provide clues to many complicated economic problems.*

At the same time, one can discern a modest shift toward regional, local, and enterprise autonomy. One sign of this is the vigorous expansion of small rural industries, often financed and directed at the county level and below, which began around 1964 and has continued to the present.[56] These enterprises now account for a significant share of overall industrial output (possibly 10–15 percent), and have contributed substantially to the expansion of certain industries, especially chemical fertilizer and cement. Local financing and marketing insure that managers of small plants will strive to maintain adequate standards of quality and profitability. Their ability to do so is enhanced by the results of research efforts begun during the Great Leap, by the accumulation of production experience and by increased flows of specialized equipment and personnel from the urban industrial sector.

Research is another area in which the center has allowed a gradual dispersion of authority. After several years in which priorities were closely circumscribed by Peking, enterprises were urged to develop independent programs of applied research based on the combined skills of technicians and ordinary shop hands.[57]

Continuing a trend begun with the downward transfer of some industrial enterprises to the provinces and municipalities in 1957–58, provinces and localities seem to have acquired a share of the planning and supervision tasks formerly assigned to industrial ministries and the State Planning Commission. In supply work, for example, regional and local government agencies now take an active role in resource allocation by organizing distribution conferences and managing commodity banks.[58]

These measures partially offset the inherent weaknesses in China's industrial system discussed above. The quality problem, for example, is under attack from both sides of the marketplace. Small plants, many developed on local initiative, now serve rural customers where the products of large factories are unsuited to their needs either because of inadequate variety (farm machinery) or inordinately high standards (iron and steel, cement). The removal of these responsibilities from the tasks assigned to large enterprises allows these units to divert human and material resources to the innovative and quality goals stressed by the center. As improved methods for allocating materials lessen the chance of inconsistency between targets and resources, enterprises can reduce the time and effort spent on accumulating "insurance" in the form of surplus materials and capacity.

Limited decentralization thus relieves some of the obvious "system costs" of a planned economy while allowing continued central direction of what the Chinese term the "commanding heights" of industry. The ubiquitous presence of the People's Bank, which participates in most significant transactions and seems responsible solely to the center, is itself sufficient to insure Peking's ultimate control over industrial operations at all levels. Continued supervision is also implicit in reports of frequent contact between central and lower-level personnel and in the regular submission of provincial, local, and enterprise plans for Peking's scrutiny and approval.

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[56] For further discussion, see Jon Sigurdson's contribution to this volume.
[57] For an example of this trend, see JPRS 31671 (1965), pp. 15–24.
[58] Richman, *Industrial Society*, pp. 712–20. I am indebted to Professor Bruce L. Reynolds for more recent information on this subject.

V. Recent Developments

The Cultural Revolution (1966–68) brought bitter attacks on post-Leap economic policies, incidentally providing further evidence of their widespread implementation. As we have seen, complaints that industrial leaders had "taken the capitalist road" by emphasizing production, profit, and material incentives at the expense of "making revolution" were not without foundation. Beginning in December 1966, youthful Red Guards and other protest groups were allowed into industrial units to combat capitalist tendencies among their personnel and management.

The new revolutionaries met with forceful opposition at all levels of industrial administration. Perhaps because the anarchistic tendencies of the insurgents stirred memories of the near-disastrous aftermath of the Great Leap, there was continuous pressure to limit the extent of disruption and to maintain some semblance of industrial normality.[59]

These efforts did not prevent sporadic disruptions of production and and temporary displacement of managers, accountants, and engineering personnel. Provincial reports indicate that overall industrial output fell by 14 percent between 1966 and 1968, but in the following year production already surpassed the 1966 peak by 14 percent.[60] As industry gradually returned to normal, it became evident that radical initiatives had failed to dislodge the incumbent industrial leadership and that policy would continue to develop along lines established during the early 1960's.

Chinese of all political persuasions are well aware that the complexity of industrial operations makes increasingly difficult to dispense with the services of expert personnel. It is therefore not surprising to find that reinstatement of disgraced specialists began as early as 1967.[61] As one editorial entitled "Bring Back the Industrial Experts" put it; [62]

> The design of products * * * drawing up of technical specifications * * * trial-making of new products * * * technical innovation * * * scientific research, et cetera, require the participation of the engineers and technicians * * * Without the engineers and technicians taking part in these activities, the level of * * * management of an enterprise cannot be heightened.

Except for a few who are "unwilling to serve socialism," politically deviant experts are not to be spurned: they can be remolded on the job.[63]

These views, which echo principles articulated 10 years earlier, are much in evidence at the microeconomic level. The Communist Party committee of Talien's Steel Mill found that "the essential management personnel were too much reduced" during the Cultural Revolution, and reacted by increasing the number of professional managers and returning recently appointed worker-managers to the production line.[64] Fushun's Coal Research Institute offers special encouragement

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[59] Some evidence of this is shown in Thomas G. Rawski, "Recent Trends in the Chinese Economy," *China Quarterly* 53 (1973), pp. 26–27.
[60] Based on data compiled by Robert M. Field, Nicholas R. Lardy, and John P. Emerson.
[61] Current Background 849 (1968), pp. 24–25.
[62] SCMP 4921 (1971, p. 9.
[63] *Ibid.*, pp. 9, 12.
[64] SCMP 5320 (1973), p. 133.

to intellectuals "trained in the old schools." [65] Politicization of specialist functions is excoriated in unusually harsh terms: [66]

We often encounter * * * comrades in financial work * * * who chant slogans about giving prominence to proletarian politics and speeding up socialist construction. But they could not give an answer when asked how much money a certain project would require, when the project could be completed for production, and how its economic effect could be developed to the fullest extent.

The impressions of recent visitors to the People's Republic reinforce documentary evidence of continuity in industrial policy. Barnett finds that [67]

Chinese Communist cadres make it very clear that central authorities again exercise effective and extensive overall control over the economy. One obtains the impression * * * that even though major annual targets are supposed to be set through a process that begins with proposals "from the bottom," in reality the crucial decisions about the most important targets are handed down "from the top."

Meisner's study of the Shenyang Transformer Factory supports this view: after semiannual consultations in Peking, the plant receives a plan which "specifies quantity, quality, variety, cost relationships, labor productivity, profits, and funding" and "also determines the total number of workers and the total amount of the wage bill." [68] Visitors to Peking's No. 1 Machine Tool Plant received an account of plan formulation little different from descriptions published in industrial journals of the mid-1950's.[69]

Similarly, Joan Robinson finds that new industrial hiring "has to be sanctioned by the Planning Commission." As for regional autonomy, "the province carried the proposals of all its enterprises to the Planning Commission," evidently to secure approval, and "every province has put in schemes of investment and the center has to ration them out." The "rules of management" in industry include such familiar provisions as "no defective goods shall be allowed to leave the factory" and "there must be strict accounting." These rules are not new, but "were drawn up much earlier" although now implemented in a new spirit.[70]

Central authority is most evident in the crucial sphere of finance. As in the 1950's, Peking determines the level of provincial and municipal expenditures through a system of revenue sharing which transfers large sums from Shanghai and other advanced regions to less developed areas.[71] At the enterprise level, budgets are authorized at the center and supervised by the People's Bank. According to Cassou, "all financial needs relating to industrial investments are directly controlled by the state budget" and "the People's Bank rigorously controls the financial situation of an enterprise." [72]

All this indicates an absence of major policy shifts in the wake of the Cultural Revolution. As can be seen from Premier Chou En-lai's

[65] SCMP 4999 (1971), pp. 180–85.
[66] SCMP 4949 (1971), p. 61.
[67] A. Doak Barnett, *Uncertain Passage* (Washington, 1974), p. 139.
[68] Mitch Meisner, "The Shenyang Transformer Factory —A Profile," *China Quarterly* 52 (1972), p. 721.
[69] "Collective Notes of the First Friendship Delegation of American Radical Political Economists to the People's Republic of China" (Ann Arbor, 1972), p. 18.
[70] Joan Robinson, *Economic Management in China* (London, 1973), pp. 20, 24, 25, 33.
[71] *Ibid.*, 27. On revenue sharing, see Nicholas R. Lardy's contribution to this volume.
[72] Pierre-Henri Cassou, "The Chinese Monetary System," *China Quarterly* 59 (1974), pp. 561, 564.

report on government work submitted to the National People's Congress held in January 1975, growth continues to occupy a leading position in the constellation of Chinese industrial objectives, but expansion is now limited by the requirement that major effort be directed toward complementarity, raising standards, and technical development.[73] Instead of concentrating on short-term increases in its own rate of expansion, the primary objective of the 1950's, China's industry has broadened its objectives, and now seeks to meet the needs of all sectors, including itself, for current inputs and future growth.

VI. Efficiency

To what degree has the industrial system described in the preceding pages enabled China to attain her major economic objectives of rapid growth, structural change, technological modernization, and military self-sufficiency? Given the resources and skills at their command, could the Chinese have achieved better results with different forms of industrial organization and management?

In a dynamic economy such as China's, these questions of efficiency cannot be answered in terms of a few summary statistics. What is needed is a careful comparison of Chinese and foreign performance in a number of areas related to overall efficiency. The following pages represent only a preliminary effort in this direction.

We begin with Paretian efficiency, which measures the performance of economies in which resources, technology, tastes, and income distribution do not change. Under these conditions, a configuration of outputs, inputs, and consumption is efficient in the Pareto sense if raising the output or consumption of any product by any economic agent necessitates reduced output or consumption elsewhere in the system.

Economic theorists have shown that Paretian efficiency cannot be attained unless each economic unit attaches the same relative values to all commodities and services. We have already seen, however, that this requirement is often violated in China's industry. Product quality, vertical integration, and inventories provide clear-cut evidence of deviations from the Paretian ideal.

Central planners, factory managers, quality inspectors, and customers do not impute identical relative values to standard and defective products. An enterprise struggling to meet its annual output target may regard minor defects in workmanship as costless, a viewpoint which customers are unlikely to share. Excessive vertical integration also appears nearly costless to the firm, which pays no interest on its fixed capital. From a national perspective, however, the costs of maintaining underutilized manufacturing facilities in a capital-scarce environment are obvious. Hoarding creates similar difficulties. Some units may be forced to reduce output for lack of materials which are in short supply only because some users have managed to conceal reserves of these items. Again, it is evident that aggregate output could rise if existing resources were properly distributed.

These examples leave no doubt that full Pareto efficiency is not achieved in Chinese industry. But is China's system more or less efficient than industry in other countries? Since departures from the

[73] "Excerpts from Address by Chou to the Congress in Peking," *New York Times*, Jan. 21, 1975, p. 12.

Pareto ideal are as difficult to measure as they are easy to detect, there can be no simple answer to this question.

In fact, no economy can approach the Paretian ideal. Numerous studies indicate that the search for growth and profit often leads American and European firms to deceive customers and public officials, hoard scarce resources, neglect quality, invest irrationally, and generally pursue microeconomic gain to the detriment of macroeconomic welfare. Organizational parallels between Western corporations and industry in the socialist bloc suggest similar degrees of economic inefficiency.[74] Bernard Baruch's conclusion regarding the extent of Paretian inefficiency, written in 1921, remains valid today: [75]

> experience . . . has clearly demonstrated that there are many practices in American industry which cost the ultimate consumers in the aggregate enormous sums without enriching the producers.

Industrial inefficiency is also common in the developing world. The combination of extensive trade barriers and elephantine rationing of foreign currency found in many countries creates domestic sellers' markets for industrial products and leads manufacturers in the direction of poor quality, neglect of innovation, hoarding, and systematic efforts to deceive and manipulate government agencies.[76] Elsewhere, inflation lowers the real cost of capital toward or even below the zero level observed in China, and provides familiar incentives for excessive integration and mechanization.[77]

Despite the existence of inefficiency in the industrial sectors of nonsocialist nations, both advanced and backward, the organizational uniformity of Chinese industry leads to the presumption that departures from the Paretian ideal are more severe under Chinese (or Soviet) institutions than with relatively heterogeneous systems of management and control. Even if individual Chinese firms create no more inefficiency than their foreign counterparts, the rigidity typified by the requirement that each unit fulfill its plan on the same date leads to uniform deviations which are compounded into quantitatively significant national economic problems.

In a nonsocialist economy, the inertia of one producer may be undone by the alert intervention of profit-seeking entrepreneurs. But in China, the drive for plan fulfillment provides a common source of microeconomic deviation which, despite the beneficial impact of recent reforms, tilts the whole industrial sector toward inefficiencies of which excessive integration and stockpiling provide only two examples.

Paretian efficiency, however, cannot tell the whole story about any real economy. The Pareto concept explicitly assumes fixed and immutable technical relations between inputs consumed and commodities produced; an implicit relationship between society's resource stock and the actual level of factor utilization also lurks in the background. Leibenstein has emphasized the artificiality of these postulates, arguing that an economy typically operates along a socially determined

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[74] As Ely Devons puts it, "When one reads about the behaviour and problems of the firm in Russia, what is striking is the similarity, not the contrast, with the problems and behaviour of firms in England or the United States" (*Papers on Planning and Economic Management* (Manchester, 1970), p. 85).

[75] Baruch, *American Industry*, p. 71.

[76] Bela Balassa, "Growth Strategies in Semi-Industrial Countries," *Quarterly Journal of Economics* 84.1 (1970), pp. 24–47 and Jagdish N. Bhagwati and Padma Desai, *India, Planning for Industrialization* (London, 1970) provide numerous examples.

[77] Balassa, pp. 32, 45.

production frontier which is separated from the higher, technically determined frontier to a degree which depends on such factors as the length and pace of the work day, the level of competition and the extent of managerial familiarity with production processes.[78] To this insight we should add that the location of the technical frontier itself depends on the extent to which society chooses to direct available resources into productive activity.

Both arguments imply that efficiency must reflect not only movements along a single production frontier (as in the Paretian case) but also the degree to which actual production approaches a limit defined by technical rather than social norms. "X-efficiency" is the term which Leibenstein uses to describe the latter criterion.

China's comparative performance in the realm of X-efficiency appears unusually strong. We know that whatever its defects, China's industrial system generates strong and continuous pressure for higher output. The growth of production occupies a central position in Chinese managerial objectives analogous to the primacy of profit in the "satisficing" mentality of Western corporations.

In any society, awareness of the risks of supply disruption and concern for professional reputations makes managers err on the side of conservatism in estimating productive capacity. But in China, hesitant managers are bombarded with demands for better results and reports of other units' success in overcoming obstacles to improved performance. Closer to home, enterprise Party committees and worker groups agitate against conservatism and force management toward fuller disclosure of potential than could be achieved in direct negotiations with Peking.

As a result, Chinese industry displays a "ratchet effect" which operates not to maintain prices, but to prevent increases in unit consumption of labor and materials. Since wide differences in technical levels create large inter-plant cost variations in most industries, emphasis on physical indicators permits greater comparability and hence sharper competition among units than would a more general cost criterion. Again, public discussion identifies leaders and spurs laggards to improve their performance.

Internal opposition to higher X-efficiency is absent or subdued in China. Trade unions are more likely to promote higher output than to campaign for on-the-job leisure. Although goldbricking undoubtedly exists, individual workers have much to gain by revealing productivity-enhancing suggestions to their superiors. Inventive workers can earn national recognition and Party membership, monetary rewards and general approbation accrue to workers who demonstrate enthusiasm and creativity on the job.

Finally, China has abolished barriers to the free circulation of technical information which restrict the level of X-efficiency in the West. Instead of spending large sums to guard trade secrets from rivals, leading manufacturers conduct training schools for workers from less-advanced units. A comprehensive system of spare-time education, technical conferences and inter-plant visits disseminates basic knowledge and spreads the latest innovations throughout industry.

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[78] Harvey Leibenstein, "Allocative Efficiency Versus 'X-efficiency,'" *American Economic Review* 56.3 (1966), pp. 392–415.

All these measures contribute to reducing the gap between realized and potential output with fixed resources. In addition, Chinese policy has vigorously attacked the problem of mobilizing resources to achieve maximum expansion of the technological production frontier. General measures in this direction, including a high and rising investment rate, employment of seasonally idle rural labor, active recruitment of females into the labor force, and major advances in education and public health are all well known. Exploitation of marginal resource deposits by small rural industries and fixing industrial prices in accordance with average rather than marginal costs, a tendency apparent in U.S. military procurement during World War II, provide further examples of policies which raise the degree to which available resources are utilized in production.[79]

Except for a relatively small number of industries involved in vigorous price competition and rare instances of commodity shortage, the peacetime economies of the industrial West cannot match the strong and continuous pressure for improved X-efficiency which is a daily feature of China's industrial scene. The recent oil contretemps, for instance, showed that "with little or no effort, American industries of all descriptions * * * can save at least 10 percent of the energy they used to consume." [80] At the same time, European firms are believed to incur excessive wage costs of 20–30%.[81] It is difficult to believe that surpluses of this magnitude can be found in Chinese consumption of raw materials, the dominant cost component in most sectors of industry.

Similar results would probably emerge from comparisons of China and other developing nations. Inventory data from several dozen major enterprises in India and China, for example, show that Indian firms typically require much more working capital for inventories alone than Chinese firms use for all purposes.[82]

In view of these considerations, it does not seem unreasonable to conclude that Chinese industry probably achieves a degree of X-efficiency which is not normally observed in nonsocialist economies. China's system displays a clear advantage in terms of mobilizing resources for productive use. At the same time, managers are strongly motivated to squeeze the most from available resources by raising output, lowering unit input coefficients and sharing information. Lacking organized strife within enterprises or secrecy between them, Chinese workers and their leaders appear able to approach industry's technical production frontier more closely than could be expected elsewhere.

Finally, we must touch upon the dynamic aspects of Chinese per-

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[79] For the rationale behind Chinese pricing policy, see Chang I-fei, "The Problem of Price Under the Socialist System," translated in ECMM 491 (1965), pp. 17–30. On the American side, one is struck by Miller's claim that "the adoption of the negotiated contract in place of * * * formal competitive bidding represented the greatest single step in the development of procurement policies during the war," even though "industry inevitably has the upper hand in these negotiations because of its superior information and the existence of a seller's market in war." See *Pricing of Military Procurements,* pp. 84–85, 44, which also notes (p. 13) that war contracts were extended to small firms "even though a price differential * * * might be necessary."

[80] Gene Smith, "A Number of Energy-Reduction Methods Help U.S. Companies Save More Than 10%," *New York Times,* Mar. 4, 1974, p. 45.

[81] *Ibid.,* Feb. 1, 1974, p. 40. The informant for this story, a management consultant, also asserted that industrial efficiency varies inversely with the strength of price competition: oil, computer, tobacco, beer and cosmetic firms show the worst performance, while textile producers who "have to be pretty hardnosed to survive" do best.

[82] Indian data from Bhagwati and Desai, *India,* p. 167; Chinese data from Nai-ruenn Chen, *Chinese Economic Statistics* (Chicago, 1967), p. 282 and from *Chūgoku sangyō bōeki sōran,* pp. 24–28.

formance. The presence or absence of either type of static efficiency—Paretian or X-efficiency—tells nothing about an economy's responsiveness to shifts in priorities or in the underlying parameters and constraints imposed by nature and by domestic or international politics. Here, too, China's record appears strong.

With its "command economy" characteristics, China's industry has successfully adjusted to a series of major and discontinuous shifts in allocation and demand: swift growth of the rate of investment after 1949; sudden expansion of the military demand for producer goods after 1960; and in the past 15 years, a continuing shift toward agricultural support activities.

The utility of administrative control over key resources in times of large and rapid shifts in allocation is accepted wisdom among Western economists, whose broad preference for the market system is waived during wartime.[83]

Western economists also agree that the market fails to direct sufficient resources into areas which combine great technical uncertainty with high cost and long gestation periods.[84] This is why we accept a monopsony-oligopoly relation between government and major defense suppliers despite the copiously documented propensity of this system to produce undesirable side effects which closely resemble the "system costs" found in Chinese and Soviet industry.[85]

Many of China's producer industries regularly engage in innovative tasks which from their perspective involve uncertainties no less serious than those faced by U.S. aerospace contractors. For these industries—and the list must include important elements of the machinery, chemical, metallurgy, petroleum, and defense sectors—China's choice of an allocative framework based on intensive negotiation between government and suppliers should be readily comprehensible to market-oriented Western economists.

Direct international comparison of the adjustment and innovative characteristics of industry is difficult. However, the experience of the 1960's has certainly demonstrated that Chinese industry is capable of meeting urgently required shifts in demand when recourse to imports is not possible. Although no crisis encountered by other large developing nations has placed similar pressures on their domestic industries, available evidence suggests that neither Brazil nor India, for example, could generate a stronger response to a major economic setback than was demonstrated by the Chinese in the wake of the Great Leap Forward.

VII. Conclusion

China's system of planned socialist industrialization aims at rapid transformation of the economy by mobilizing resources to raise output for investment and defense as well as for consumption. Consumer preferences, including individual desires for leisure both on and off

[83] After setting out to criticize the direct controls implemented within the United States during World War II, Tibor Scitovsky, Edward Shaw and Lorie Tarshis are forced to conclude that especially in military-related goods, "the pricing system would not allocate goods adequately" in a future national emergency. See their *Mobilizing Resources for War* (N.Y., 1951), p. 207.

[84] Kenneth Arrow, "Economic Welfare and the Allocation of Resources for Invention," in Nathan Rosenberg ed., *The Economics of Technological Change* (Harmondsworth, England, 1971), p. 169.

[85] See Frederic M. Scherer, *The Weapons Acquisition Process* (Boston, 1964), which refers specifically to the Soviet parallel on pp. 211ff.

the job, occupy a distinctly subordinate position in the constellation of official goals.

In light of these objectives, our evaluation of performance in China's post-1949 industrial system must be broadly favorable. The preceding survey has shown that reliance on administrative rather than market control over resource allocation has contributed to China's achievements in raising the level, changing the structure and compressing the real cost of industrial output. This finding draws support from favorable comparisons of industrial growth in China and in other large industrial latecomers, and also from the revealed preference of the industrial democracies for nonmarket distribution of essential resources in wartime, when resource mobilization and rapid structural change replace consumer welfare as primary national goals.

We have also found that despite its successes, Chinese industry remains far from ideally efficient, especially in Paretian terms. Emphasis on quality objectives, limited decentralization, increased attention to profit and cost criteria and the "ratchet effect" of state and Party pressure for constant improvement in industrial operations have raised the minimum performance floor beneath which enterprises can expect swift official criticism, but recent news reports show that excessive attention to output volume, hoarding, unwillingness to innovate and other malpractices have not disappeared from China's industrial scene.

The presence of these and other forms of resource leakage from productive tasks is not unique to China. Any system has its own built-in waste—the effects of pollution, commuting and product differentiation come to mind in the American case—and it is difficult to argue that these costs are higher in China than elsewhere.[86]

In China's case, the remaining hardcore inefficiencies are much easier to detect than to remedy. Hoarding, for example, could be curtailed by combining stringent control of working funds, random inventory checks, and harsh, well-publicized punishment of violators. But without major reforms in the whole system of allocating and distributing materials, reduced inventories would raise the chances of supply-linked disruptions throughout industry, and might lower rather than raise output. The administrative and financial cost of the changes needed to maintain smooth production could easily outweigh the more obvious gains from liquidating excessive stockpiles.

This finding provides a typical illustration of the theory of the second-best, which teaches that correcting one among many inefficiencies may do more harm than good. This history of Soviet economic reform proposals as well as American defense procurement shows that even marginal institutional shifts may conceal a crossfire of analytic complications. This lends authority to the suggestion that in China too, simple and seemingly beneficial reforms might set off complex interactions which could interfere with the basic goals of growth and structural change.

It is entirely possible that with their relatively static product mix, modest growth rates and markets which show signs of becoming less homogeneous as personal incomes rise, China's consumer industries

[86] On the concept of built-in costs, see Simon Kuznets, *Economic Growth of Nation: Total Output and Production Structure* (Cambridge, 1971), pp. 75–98; also E. J. Mishan, *The Costs of Economic Growth* (London, 1967).

could benefit from a substantial shift toward market-linked methods of allocation. But in the dominant producer sector, the continuing prominence of ambitious targets, technical uncertainty and unpredictable demand suggests that as in the past 25 years, fundamental institutional change holds little prospect for improving the performance of China's industrial system.

WORKERS' INCENTIVES IN CHINESE INDUSTRY*

By CARL RISKIN

As the "leading force" in China's economy, industry plays a role that decisively affects her entire development performance. The success that attends this role in turn depends upon the resourcefulness, skill, diligence, and creativity of the men and women who staff the enterprises of the industrial sector. While such a statement might be readily applicable to any other society as well, it is of particular interest in one whose leadership puts as much stress on the importance of the human factor as does the Maoist leadership in China. In such a society, one might expect to find special attention paid to the nurturing of human motivation, not only as an end in itself, but as a potent force for achieving economic modernization.

This essay surveys the main forces and mechanisms affecting the motivation of the industrial workforce in China today. It begins with a discussion of the general theoretical approach to wages and incentives contained in current Chinese Marxist discussion, and proceeds to take up in turn the factors that influence the motivation to become an industrial worker, considerations affecting the choice of occupation within the industrial sector, and the incentives to diligent and creative labor in one's industrial job. Throughout the essay, and particularly in its conclusion, attention is called to the innate social and psychological complexity of the subject of human motivation, and the importance in particular of the socio-political setting in which work takes place to the attitudes that determine work morale and productivity.

GENERAL DOCTRINE

China's wage system, according to the Chinese themselves, is still in part a "bourgeois" system of distribution. All sides in recent debates and discussions about wage reform agree on this point and regard it as inevitable for a certain period of time. The fundamental text cited in such discussions is Marx's "Critique of the Gotha Program," which is therefore worth quoting at some length:

> What we have to deal with here is a communist society, not as it has *developed* on its own foundations, but, on the contrary, just as it *emerges* from capitalist society; which is thus in every respect, economically, morally and intellectually, still stamped with the birth marks of the old society from whose womb it emerges. Accordingly, the individual producer receives back from society—after the deductions have been made—exactly what he gives to it. * * * The same amount of labor which he has given to society in one

*I am indebted to Professors Audrey Donnithorne, Alexander Eckstein, Sam Noumoff, Hugh Patrick, Bruce L. Reynolds, Lloyd G. Reynolds, and Robert Scalapino for making available to me notes of their observations in China. Professor Donnithorne also brought other relevant materials to my attention, for which I am most grateful to her. The above persons are not responsible for the use I have made of these materials.

form he receives back in another. * * * Hence, *equal right* here is still—in principle—*bourgeois right.* * * * The right of the producers is *proportional* to the labor they supply; the equality consists in the fact that measurement is made with an *equal standard,* labor. But one man is superior to another physically or mentally and so supplies more labor in the same time, or can work for a longer time; and labor, to serve as a measure, must be defined by its duration or intensity, otherwise it ceases to be a standard of measurement. This *equal* right is an unequal right for unequal labor. It recognizes no class differences, because everyone is only a worker like everyone else; *but it tacitly recognizes unequal individual endowment and thus productive capacity of the worker as natural privileges* [emphasis added]. It is, *therefore, a right of inequality, in its content, like every right.* * * * Further, one worker is married, another not; one has more children than another, and so on and so forth. Thus, with an equal performance of labor, and hence an equal share in the social consumption fund, one will in fact receive more than another, one will be richer than another, and so on. To avoid all these defects, right instead of being equal would have to be unequal.

But these defects are inevitable in the first phase of communist society as it is when it has just emerged after prolonged birth pangs from capitalist society. Right can never be higher than the economic, structure of society and its cultural development conditioned thereby.[1]

It can easily be seen that, in both its content and what it omits, this passage leaves behind a myriad of problems that must be confronted in its practical application to a functioning socialist society. For example, how are different types of labor, operating in different industries with different technologies, and embodying various degrees of skill and education, in fact to be reduced to a common denominator for the purpose of calculating the wages due each? How are differences in quality of labor traceable to the individual laborers themselves, to be distinguished from such differences due instead to the efficiency of organization and operation of the units to which the laborers belong? Should the results of (unequally provided) education and training be treated as "human capital," i.e., property as distinct from labor power, and thus exempted from entitling the endowed individual to income just as if it were physical, tangible property which had been nationalized or collectivized? Perhaps most importantly, how rapidly and in what concrete manner should the inequalities due to "bourgeois right" be restricted and eliminated in the process of transition to communism?

On none of these questions, unavoidable as they are to a society bent upon developing in a socialist direction, do the basic Marxist texts throw much light. All have been at one time or another the focal points of dispute in the ongoing struggle between those who would preserve (or even increase) existing distributional inequalities in keeping with the state of development of the economy and of the social consciousness of the workforce, and those who would reduce or eliminate them as a reflection of and further contribution to the advance of Chinese socialism. Thus, far from being perceived as merely technical questions involved in the allocation of labor, these issues are treated as among the fundamental determinants of whether China progresses or retrogresses in the development of socialism. It is argued, for example, that "the existence of bourgeois right provides the vital economic basis for (the) emergence" of "new bourgeois elements:"

if the consolidation, extension and strengthening of bourgeois right and that part of inequality it entails are called for, the inevitable result will be polarization, i.e., a small number of people will in the course of distribution acquire increasing amounts of commodities and money through certain legal channels and

[1] Taken from citation in *Peking Review,* Feb. 28, 1975, pp. 8–9.

numerous illegal ones; capitalist ideas of amassing fortunes and craving for personal fame and gain, stimulated by such "material incentives," will spread unchecked; public property will be turned into private property * * * the capitalist principle of the exchange of commodities will make its way into political life and even into party life, undermine the socialist planned economy. * * *[2]

Early in 1975, Mao Tse-tung himself, in a brief "instruction" to the people, called attention to the fact that China's current wage system is "scarcely different from (that) in the old society," and he suggested that this system "can only be restricted under the dictatorship of the proletariat."[3] Mao's intervention on this issue testifies to its continuing importance in debates over the path of socialist development in China.

The general principles followed by the Chinese are easily summarized: "the money wage received by a laborer, represents a part of the total output of society used for individual consumption; this part corresponds to the amount and quality of each worker's labor, to his social contribution."[4] This wage "reflects the relations between the individual laborer and the state representing the interests of the entire working people."[5] Insofar as the worker spends part of his day working not for his own individual consumption but for "the state representing the interest of the entire working people," he is working for his own direct or indirect interest, and thus no exploitation is involved. However, the successful claiming of special privileges and high incomes by upper echelons can reintroduce the threat of exploitation if not the thing itself.

Industrial wages are overtly and unabashedly kept low. In a meeting in late 1974 with visiting overseas Chinese, Vice-Premier Teng Hsiao-ping is said to have put this policy with unusual bluntness:

Wages are low and the living standard is not high. We only get enough clothing and a full stomach. To develop the economy, this situation must be maintained for some time to come. We have made this clear to the people. The people understand. * * *[6]

Another reason for the low-wage policy is to help "consolidate the worker-peasant alliance" by permitting a gradual reduction in the gap between urban and rural living standards—i.e., allowing the peasants to catch up to the workers—and simultaneously thereby to relieve pressures for excessive rural-urban migration.

Nonetheless, state and party policy is to gradually raise the level of wages, a policy applied unevenly over time but which is said to have led to a 1971 national average wage level some 50 percent higher than in 1952.[7] The significance of this rise for the welfare of workers is linked to three related phenomena: (1) The guarantee of job security and full employment; (2) the maintenance of price stability (consumer goods prices are said to have dropped by 2.3 percent in Shanghai from 1965 to 1970); and (3) the provision by the state of health, education and welfare goods and services.[8] Between them, these three sup-

[2] Yao Wen-yuan, "On the Social Basis of the Lin Piao Anti-Party Clique," *Hung Ch'i*, March 1975, translated in News from Hsinhua News Agency, Mar. 2, 1975, pp. 16–17.

[3] *Peking Review*, Feb. 28, 1975, p. 5.

[4] *Liang-chung she-hui, liang-chung kung-tzu* (two kinds of society, two kinds of wages), Shanghai, 1973, p. 8. This small book, which provides a thorough summary of the principles of China's wage system, was written by "comrades from the Shanghai Hutung Shipyards and the Sixth Economic Group of Shanghai Municipal May Seventh Cadre Schools."

[5] Ibid., p. 9.

[6] Teng Hsiao-ping interview of Oct. 2, 1974, quoted from notes of Prof. Fan Lan and reported in the Hong Kong left student publication, *Chiu Shih Nien Tai*, December 1974, pp. 15–17.

[7] *Liang-shung she-hui*, p. 15.

[8] Ibid., pp. 15–19.

status brings with it. Unemployment was a chronic problem in the 1950's and again in the wake of the Great Leap Forward of 1958–60, when a severe economic decline caused millions of workers newly recruited during the Leap to be sent back to the countryside. With the exception of the latter period, most unemployment was either left over from before 1949, or has been the product of "blind infiltration" of the cities by peasants in search of industrial work. Once provided with a job in state industry, the worker is quite sure of longterm employment.[25] With the growth of industrial production, widespread development of relatively labor-intensive rural industries, and the intensification of cultivation in agriculture, overt unemployment in the cities seems to have been reduced to inconspicuous levels.[26] Part of the process of reducing it, however, has been the pressure exerted on skilled urban residents, including workers, to volunteer for service in the countryside where their skills would be used to develop the poorest areas of the country. Since few relatively privileged occupations have been immune to such pressures, they hardly constitute a disincentive to become an industrial worker. This issue will be touched on again in the next section.

The medical, educational and welfare needs of state industrial workers are met with a degree of certitude and quality much higher than is the case for peasants. Medical care is provided free to state employees, and at 50 percent of cost to their dependents. In the event of difficulty in meeting the dependents' fee, aid is provided from the enterprise welfare fund. The great bulk of educational costs are met by the state, and enterprises typically run nurseries and creches as well as schools, at nominal tuition cost, so that both parents can take jobs. In addition to financing the building of welfare facilities, salaries of doctors, teachers and other social welfare personnel, enterprise welfare funds—which typically total about 12 or 13 percent of the wage and salary bill[27]—also pay for a variety of recreational, cultural, educational, trade union and insurance functions. Although urban housing is usually cramped and kitchen and bathroom facilities typically shared between two or more families, rents are well below costs and come to no more than 4 or 5 percent of the employee's basic monthly wage.[28] The retirement age varies with the enterprise; typically men are eligible for retirement at 55 or 60 and women 5 years earlier. The pension, paid by the state, is 60 or 70 percent of the last month's salary. Government and party cadres get 70 percent of salary after 10 years of work, 85 percent after 20–30 years.[29] Sick leave is paid at 60–100 percent of wages for 6 months, depending upon the enterprise and duration of work, and at somewhat lower percentages thereafter. Total disability resulting from an injury sustained at work entitles

[25] Charles Hoffmann, *The Chinese Worker*, Albany, 1974, pp. 67, 68. Important exceptions are the categories of temporary and contract workers, who do not have long term tenure or many of the welfare benefits that go with it. See Howe, *Wage Patterns*, pp. 107–8 and 127–9.

[26] Hoffman, *The Chinese Worker*, pp. 49–55.

[27] Richman, *Industrial Society in Communist China*, N.Y. : Random House, 1969, p. 807; Riskin, "Maoism and Motivation," p. 20. The percentage of the wage bill mentioned is apparently sometimes exceeded; *Liang-chung she-hui* claims that "payments for collective welfare expenses in not a few units correspond to 30 or 40 percent of the total wages bill of workers and employees" (p. 18).

[28] Richman, *Industrial Society*, p. 806; Hoffman, *Chinese Worker*, p. 165.

[29] Bettelheim, *Cultural Revolution*, p. 15; "China Trip Notes," Alexander Eckstein, mimeo, 1974. Retirement is not mandatory.

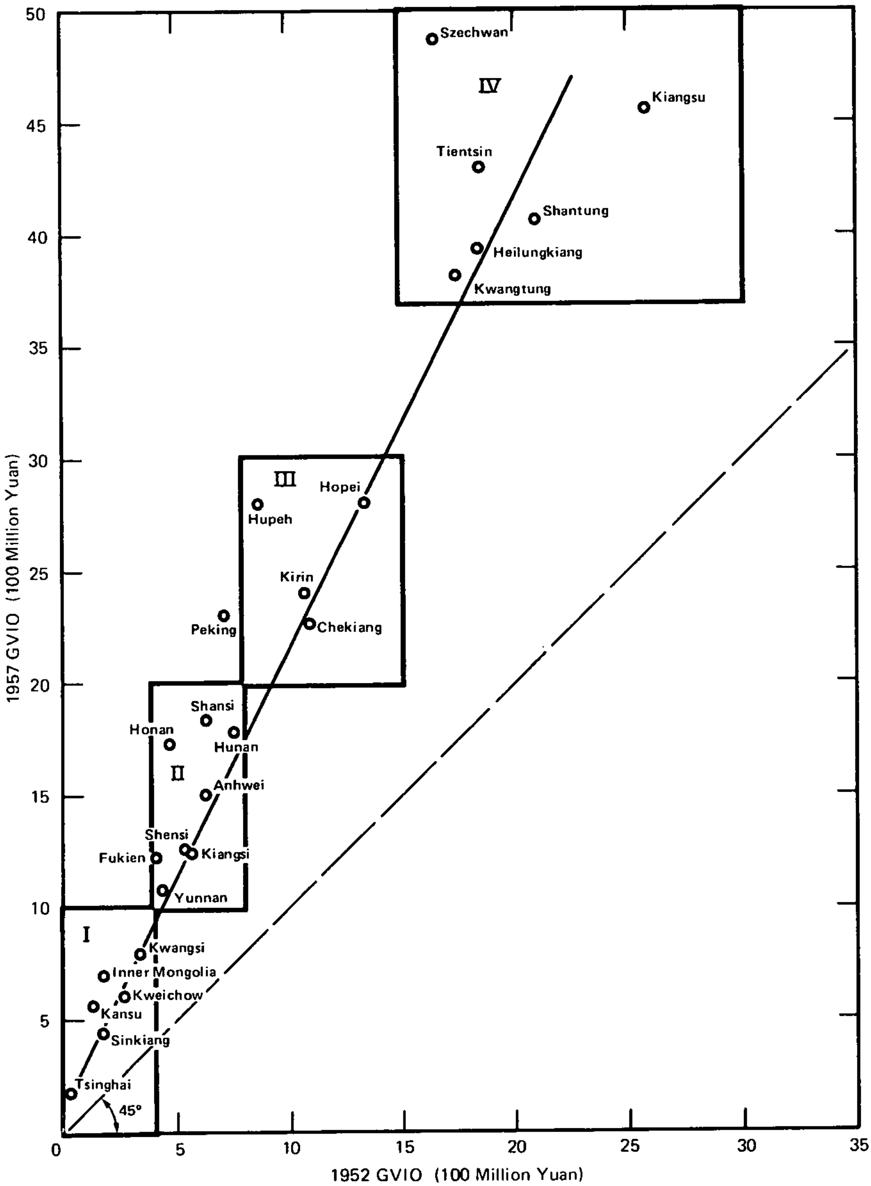
the worker to 60 percent of his wages for life or until he is able to work again. Women workers get maternity leave at full pay for 56 days.[30]

In all of these respects, and others too numerous and detailed to summarize here, the urban worker's life is materially secure to a degree unmatched in the countryside. To be sure, China's peasants have been freed from the threat of starvation and extreme poverty that afflicted their forebears. But only in recent years, especially since the Cultural Revolution have they begun to enjoy benefits like those of industrial workers detailed above. A variety of state-subsidized cooperative educational and insurance programs, together with the Maoist policy of allocating medical, educational, and cultural resources to the countryside, have only begun to close the gap. At present, the industrial worker is still materially privileged, and his occupation therefore relatively attractive.

Related to the direct material advantages of industrial employment are its indirect attractions. Industrial production has grown substantially faster than farm production in China, and, to the degree that it has been concentrated in certain regions of the country, those have been the developing regions. They would be likely to feature a more dynamic environment, a greater variety of consumer goods and services, a larger number of opportunities for technical and occupational advancement, a generally more stimulating atmosphere, than other areas of the country. During the First Five-Year Plan years (1953–57), for example, the tendency for already more industrialized provinces to grow away from the more backward ones was pronounced. This trend can be seen clearly in figure 1, which plots provincial gross industrial output in the final year of the plan, 1957, against provincial GVIO in the base year of 1952. If the absolute differences between provinces in industrial production had remained constant over the period, a line fitted to the points on the graph would have a slope of one (i.e., it would be parallel to the 45° line drawn from the origin). As can easily be seen, however, such a fitted line has a substantially steeper slope, indicating that the provinces which were initially more industrialized, increased their advantage over the First Five-Year Plan years. (The inclusion of Liaoning Province and Shanghai Municipality, whose industrial outputs were so high as to be off the scale in both years, would leave this conclusion unaltered.) Indeed, Shanghai added to its industrial production over the FFYP period an amount greater than the 1957 production of every province but Liaoning.

[30] Hoffmann, *Work Incentive Practices and Policies in the People's Republic of China, 1953–1965*, Albany, 1967, pp. 37–38; "Observations on the Chinese Economy," a report of a visit to China by five American economists, mimeo, 1973.

Figure 1. THE GROWING INDUSTRIALIZATION GAP: Gross Value of Industrial Output, by Province, 1952 and 1957



Source: Table 1

TABLE 1.—GROSS VALUE OF INDUSTRIAL OUTPUT, BY PROVINCE, 1952 AND 1957

[Millions of 1952 yuan]

Province	GVIO, 1952	GVIO, 1957
Group I:		
Tsinghai	36	108
Kweichow	269	605
Kansu	137	567
Sinkiang	175	446
Kwangsi	343	798
Inner Mongolia	178	703
Group II:		
Fukien	414	1,224
Yunnan	444	1,078
Kiangsi	575	1,249
Shensi	545	1,263
Hunan	767	1,788
Honan	478	1,737
Shansi	643	1,832
Anhwei	631	1,501
Group III:		
Peking	715	2,307
Hupeh	858	2,803
Kirin	1,070	2,400
Chekiang	1,099	2,274
Hopei	1,342	2,805
Group IV:		
Szechwan	1,649	4,873
Kwangtung	1,745	3,812
Heilungkiang	1,839	3,930
Tientsin	1,850	4,300
Shantung	2,091	4,068
Kiangsu	2,584	4,553
Group V:		
Liaoning	4,761	11,751
Shanghai	6,523	12,969

Source: R. M. Field, N. R. Lardy and J. P. Emerson, "A Reconstruction of the Gross Value of Industrial Output by Province in the People's Republic of China: 1949–1973," U.S. Department of Commerce, forthcoming.

This situation can be summarized by reference to the standard deviations of the provincial distributions of industrial output in 1952 and 1957 (table 1). The fact that the standard deviation in 1952 (1.4 billion yuan) was greater than the average provincial industrial output (1.25 billion yuan) is an indication of the great unevenness of provincial industrial development initially. Yet the standard deviation more than doubled (to 3 billion yuan) by 1957, signifying that the absolute dispersion of industrial output between advanced and backward provinces increased.

This is not to say that no industrial progress occurred in more backward regions during the First Plan period. Indeed, in relative terms, the pace of industrialization was greater in those provinces that were initially less industrialized. Thus the average industrial output grew faster even than the standard deviation, causing the coefficient of variation (standard deviation divided by mean) to decline slightly (from 1.12 in 1952 to 1.04 in 1957). But this result is due largely to the very low bases from which growth began in the poorer provinces. With respect to the "growth pole" effect in attracting potential industrial workers, it is likely that the large gains in absolute production levels of the already more advanced provinces exercised the dominant influence.

Closer inspection of figure 1 reveals that the provinces are not spread out along a continuum on the graph, but rather that they tend to cluster into several distinct groups. I have marked off four with rectangles and numbered them in ascending order of industrial development. A fifth, consisting of Liaoning and Shanghai, was too industrialized to fit the scale of figure 1. These groups are defined with reference to industrial production both in 1952 and 1957. Thus, a province could be located in group 1 in 1952 by producing a gross industrial output of 400 million yuan or less in that year, but group II in 1957 by producing more than 1 billion yuan in 1957.

Yet the notable fact is that with the exception only of Peking Municipality every province retained the same group rank in 1957 that it had in 1952. In other words, although there was a good deal of reversal of individual ranks between 1952 and 1957, these reversals took place only with near neighbors in the rank list, so that when five groups ranked according to industrial production are formed for each of these 2 years, the composition of each group remains identical (except for Peking's shift from group II to group IIIa).

While an inquiry into the cause of this grouping phenomenon is beyond our scope here, the clusters are significant from the perspective of incentives to become a worker because they indicate a dramatic contrast between advanced and backward areas, and consequently a greater identifiability to mobile workers of the nation's dynamic growth centers.

It is evident that the party and government have made great efforts, especially since the mid-1960's, to combat the image of the major industrialized cities as the locus of opportunity. Such a perception has given rise to serious problems of rural-urban migration and burgeoning urban unemployment throughout Asia and other areas of the Third World,[31] as well as in China during the 1950's. Countermeasures taken by the Chinese have included greatly increased attention to development of rural areas, towns, and small and medium-sized cities, together with a greater allocation of human and material resources to such areas, and an ideological campaign to inculcate the value of going to (or remaining in) the backward areas to help them catch up. In addition, of course, administrative measures such as food rationing are used to prevent undesired migration. Whereas not all of these policies have necessarily diminished the advantages of relatively developed regions,[32] on the whole there is little doubt that together they have reduced the objective and subjective incentives to become an industrial worker.

INCENTIVES TO BE ALLOCATED

The allocation of workers among different jobs, industries, sectors, and locations is of course closely linked to motivational considerations. Workers who find that their job assignments are in accord with their own wishes are likely to be not only happier but also more productive. In a planned economy, the allocation of labor must follow closely upon the sectoral, industrial, and locational characteristics of the comprehensive development plan. Broadly speaking, there are two kinds of mechanisms for achieving the desired configuration of jobs, in a manner consistent with the wishes of the individuals concerned. The first is for planners to manipulate relative wages so as to attract workers into the desired categories. The second, most simply put, is to persuade workers to put themselves at the disposal of the government offices in charge of labor allocation, and to accept assignment accordingly. The two alternatives clearly have different sociopolitical ramifications.

[31] See, e.g., U.N., E.C.A.F.E., *Economic Survey of Asia and the Far East,* 1971.
[32] For example, the Chinese freely acknowledge that "local industry has developed on a larger scale and at a faster speed in provinces that have a much better industrial foundation." ("Local Industry in China," *Peking Review,* No. 39, Sept. 24, 1971.)

The use of relative wage manipulation to allocate labor has encountered several sorts of problems in China. Ideologically, it is inconsistent with the socialist dictum, "to each according to his labor," since it results in different payments for the same amounts and kinds of labor. More seriously, it appeals directly to the motive of self-gain, and hence helps to perpetuate in the individual and in society an ethic that is corrosive of the values that party and government seek to spread. Finally, attempts to use the labor market in this way, especially in the 1950's, have been hindered by a variety of technical problems, such as the constraints imposed by the inherited wage structure, regional differences in agricultural income, dysfunctional wage behavior in the private sector, the difficulty of changing the wage structure without raising the total wage bill, et cetera.[33]

For all of these reasons, the attempt to allocate labor by means of wage structure manipulation was greatly curtailed after 1957 in favor of administrative allocation. Before that time, a certain amount of progress had been made in molding the wage structure into a shape considered rational by the planners. For example, the interindustry ranking of wages accorded higher wages to more skill-intensive and fast growing industries, and the more rapidly growing regions of the country seem to have had bigger increases in wages.[34] Under the predominant characteristic of labor surplus, however, with ready supplies of unskilled labor available for most kinds of nonagricultural jobs, the efficacy of such relatively fine tuning as well as the cost of failure to do so may not have been very great. One case in which the structure of incomes was clearly dysfunctional and burdensome, as we have seen, was the urban-rural differential, which triggered substantial migration to the cities.

At present, horizontal allocation of labor is done chiefly by the second method mentioned above, namely, administrative assignment. New workers are assigned jobs upon graduation from middle or technical school or university by whatever government bureau is in charge of planning and balancing at the level of the enterprise in question, most frequently the municipal labor bureau or (for rural industries) the hsien labor office. Hiring is mainly to replace retiring workers and to staff new or enlarged enterprises. Inquiring visitors have found the quit rate "phenomenally low."[35] A worker with a strong reason for wanting to transfer to another job or enterprise may apply to do so, but such transfers cannot be made at will.[36]

What factors determine the degree to which workers are positively motivated to fulfill the tasks to which they are assigned by such administrative methods? A really satisfactory answer will depend on considerations of a social psychological nature, and will also require considerably more direct observation of Chinese industrial life than has been possible up to now. A few observations will therefore have to suffice.

First, since as we have seen employment in the state sector (especially in industry) accords to the workers a materially privileged existence relative to the lives of the majority of the population, the worker

[33] For a thorough discussion of such problems, see Howe, *Wage Patterns*, chs. 4 and 7.
[34] *Ibid.*, pp. 61–65.
[35] "Observations on the Chinese Economy," p. 23.
[36] See Hoffmann, *Chinese Worker*, pp. 85–92 for a discussion of the regulation of worker mobility.

in such a fortunate position may regard the question of exactly where and at what he or she will work as decidedly secondary, and gladly accept assignment. This is similar to the case of an American high school student whose choice of college depends upon which one offers a scholarship—or, perhaps a closer analogy, to workers in a slack labor market who regard themselves as fortunate to find any of a wide range of potentially secure and remunerative jobs.

Second, positive worker motivation must depend to some extent on the sensitivity and responsiveness of the allocating authorities to the needs and desires of the individual workers. Arbitrary and inflexible behavior on the part of the labor office will not only deprive society of a good fit between jobs and aptitudes but will also condemn it to receive the output of passive and indifferent workers.

Related to this consideration is the degree to which workers identify with the objectives of party and state and are therefore motivated to participate in attaining those objectives. In this regard, not only are the contents of the social contract between worker and society at issue, but also the means of arriving at it. Both of the above factors—the material standard of living enjoyed by workers and the behavior of state representatives toward workers—are part of this broader question. So are the distribution of income in society as a whole and within the enterprise, and the degree to which workers share authority to make all kinds of decisions about their working and nonworking lives. Therefore, the efficacy of administrative methods of allocating labor—especially in the long run—is not a simple, technical question. The debates that have occurred in China over bureaucratization, various forms of worker participation in management and cadre participation in labor, the proper organization of enterprise decisionmaking organs, et cetera, are all, in one sense, inevitable concomitants of the decision to allocate labor by planning rather than by reliance on the market and still have a vigorously motivated workforce. The link between worker motivation and the "relations of production" will be discussed briefly in the conclusion to this paper.

One particular mode of allocation peculiar to China but of great importance there is the mass transfer of groups of urban residents—workers, cadres, technicians, and educated youth—to the countryside. Such hsia fang (transfer down) and hsia hsiang (down to the countryside) movements have appeared recurrently, and especially in the late 1950's, early 1960's and again during the Cultural Revolution and extending into the 1970's. The mass character and often politically charged atmosphere of this kind of allocation differs substantially from the routinized allotment of jobs to individuals.[37] Volunteering for assignment in such a campaign may well mean a reduction in personal material prospects—income, fringe benefits, security—as well as cultural problems of adjustment. This system of allocation therefore is apt to entail a contradiction between the personal material interest of the individual and the economic and social objectives of society.[38] Predictably, therefore, it has met with greater motivational

[37] Hoffmann, *Chinese Worker*, 1974, pp. 74–76.

[38] See D. Gordon White, "The Politics of Hsia-hsiang Youth," *The China Quarterly*, No. 59, July–September 1974, for an interesting discussion of the attitudes of youth sent down to the countryside. White points out that some of the problems encountered by these programs stem from the ambiguity introduced by the variety of social goals they have been designed to meet. These include contributing skills and knowledge to developing the countryside, reeducating youth through contact with peasants, reducing labor surpluses in the cities, simplifying urban bureaucracy, etc.

obstacles than have been evident in the routinized allocation of individuals, and resistance to such transfers has continued to be acknowledged and much discussed in the Chinese press. However, the policy itself speaks to problems of monumental proportions that, although endemic to many other less developed countries, have nowhere been confronted as seriously as in China. If, together with the pumping of material resources into the countryside, it succeeds in reducing the disparity in living standards and cultural levels between city and village, it will thereby reduce the material and cultural disincentives to its own implementation. Moreover, post-Cultural Revolution reforms in the hsia-hsiang program that make the burden more nearly universal and therefore equally shared, may have provided "a more favorable social and ideological context for the successful adaptation of urban youth to rural life." [39]

Incentive for Diligence and Skill Improvement

The host of cultural, historical, and social factors that enter into the formations of workers' attitudes toward their jobs makes the study of workplace motivation in any society a complex problem. For China, this general difficulty is componded by our lack of first-hand experience of conditions in Chinese industrial enterprises and the consequent necessity of relying upon official statements of policy, articles of a horatory or instructive nature, and travelers' reports that are necessarily superficial. One benefit of the increase in numbers of Americans and other Westerners visiting China since 1971, however, is the collection by them in a number of industrial enterprises of specific examples of wage structures whose incentive properties can be examined. This section, therefore, focuses upon the relation between wages and incentives in Chinese industry.

In an earlier discussion of worker motivation in China, I observed that whereas economic organization in the collective sector (particularly agriculture) embracing the majority of the population operates according to an apparently effective mix of internal and collective material incentives, the same is not true of the state industrial sector.[40] Here, there is neither the close and organic link between group behavior and material transformation of the immediate environment that characterizes the internal incentives of the collective sector, nor the direct relation between group effort and group income that is typical of collective material incentive arrangements. In state industry, therefore, worker motivation is associated with three other kinds of factors: (1) The degree of intrinsic satisfaction embodied in the job itself; (2) The degree of identification of the worker with the objectives of the enterprise (and of the larger society); and (3) The external gains, both material and non-material, that reward individual effort and skill improvement.

The third factor, to which the discussion of this section is limited, includes the classic forms of material incentives, as well as the use of symbolic and honorific rewards to substitute prestige for income as

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[39] White, "The Politics of *Hsia-hsiang* Youth," p. 516.

[40] See Riskin, "Maoism and Motivation," pp. 17–22. "External incentives are rewards allocated by persons external to the recipient, usually on the basis of objective criteria of performance; internal incentives are rewards and penalties that arise within a person as a result of his work experience." Howe, *Wage Patterns*, pp. 136–137. For a discussion of this classification of incentives for China, see "Maoism and Motivation," pp. 21–22.

a stimulus of work. It would of course be as foolish to asume that Chinese workers are motivated solely by such mechanisms as to make a similar assumption about workers of any other nationality.[41] Other considerations associated with the first two categories listed above, and especially having to do with the subdivision of labor into repetitive tasks and the relation between incentives and the division of income and decisionmaking authority within the enterprise, will be reserved for comment in the conclusion of this essay.

A heavy reliance on personal material incentives requires that there be a close and predictable relation between the quantity and quality of an individual's work, on the one hand, and his income, on the other. The principal mechanisms for achieving such a link are progressive piece rates, bonuses and other types of awards, and wage differentials. The first two can be discussed cursorily because they currently play no significant role in the Chinese system of income distribution.

Piece rates were favored by Chinese planners in the 1950's, although their most extreme form, progressive rates by which payment rises more rapidly than output, was never widely adopted.[42] Methods of implementation varied widely, but most were connected with the system of standard wage grades (discussed below) and paid more or less than a worker's grade, depending upon the quantity and quality of his output.[43]

The use of piece rate mechanisms reached a peak in 1956, when they covered some 42 percent of the work force. Criticized during the Great Leap forward, they nevertheless were still applied to 35 percent of the work force in 1959.[44] Information on their use in the 1960's is scanty, but they apparently were still present in Chinese industry until coming under widespread attack during the Cultural Revolution as a prime example of "economic" reliance on material incentives. Largely abandoned at that time, they have not made a comeback and are an insignificant feature at present in China.[45]

Bonuses and other forms of premiums tied to performance have had greater longevity. Widely in use in the 1950's,[46] they survived the Great Leap and continued to be common into the midsixties. Barry Richman found bonus systems in operation at 30 of the 38 industrial enterprises he surveyed in 1966, and they applied to workers, middle- and lower-level managers and technical personnel. These enterprises had bonus funds equal to 5 to 15 percent of the total wage and salary bills, about 20 percent of eligible personnel received maximum allowable bonuses, and 10 to 15 percent received no bonus at all. A variety of success indicators were used as criteria for awarding bonuses, among workers they were frequently awarded for group rather than individual performance, and at some enterprises cadres in general, or certain types of cadres, were specifically exempted from eligibility.[47]

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[41] For a discussion of recent worker attitudes in the United States, see *Work in America*, Report of a Special Task Force to the Secretary of Health, Education, and Welfare, Cambridge, the MIT Press, 1973.

[42] Hoffman, *Chinese Worker*, p. 104. Mao in 1942 advocated a progressive piece-rate system "to stimulate work activism and increase the quantity and quality of output." Quoted in Howe, *Wage Patterns*, p. 59.

[43] Hoffmann, *Chinese Worker*, pp. 104–106 describes some of the principal mechanisms used.

[44] Howe, *Wage Patterns*, pp. 120–121.

[45] Hoffman, *Chinese Worker*, p. 106. Richman (*Industrial Society*, p. 811) found no examples of piece rate systems at any of the 39 industrial enterprises he visited in 1966.

[46] Howe, *Wage Patterns*, pp. 121–124.

[47] Richman, *Industrial Society*, pp. 801–802, 811–15.

Bonus and premium systems, like piece rate systems, came under attack during the Cultural Revolution and disappeared from the scene. Already in April–June 1966, some of the enterprises visited by Richman had eliminated them, and others were planning or "seriously considering" doing so.[48] The implementation of such systems encountered a number of technical problems which led to wasteful use of inputs and the tendency toward inflation of the wage bill.[49] But the serious charge against them was political, for they were the very epitome of a material incentive. A visitor in April 1968 was told in one enterprise after another that the chief problem had not been the formal wage structure, which was rational enough, but the payment of prizes, including sales, innovation, safety, overfulfillment, and length of service bonuses. These engendered an ideology of self-interest and seriously harmed unity by turning workers against each other and breeding jealousy and discontent. During my own visit in August 1972, several enterprises reported that bonus funds were now equally divided among all workers as an automatic addition to the basic wage.

Emulation campaigns and contests utilizing nonmaterial awards, money, and other material prizes, have also been widely employed in China since the 1950's. A large variety of inducements has been brought to bear, including honorific titles (outstanding producer, model worker, hero of labor), opportunities for occupational advance, attendance at prestigious meetings of model workers, vacation, and travel privileges, medals, banners, and certificates.[50] Although in the post-Cultural Revolution atmosphere of hostility to material incentives, awards of material value have given way to purely honorific designations, emulation campaigns have continued to be implemented on a substantial scale. For example, one set of guidelines that emerged from a Hunan symposium on political work in industry in October 1971, stipulated that emulation campaigns:

> should have production content and specific targets and involve politics, ideology and style of work. Assessments should be held periodically under the leadership of the CCP committees to cite the progressives. Progressive collectives and individuals who emerge should be cited and rewarded according to the size of their contribution. Outstanding ones can be awarded the glorious titles of "progressive worker," "labor model," and "adept in technical innovation."[51]

Emulation campaigns, even when they do not involve material rewards, share some of the characteristics of "material incentives." Like the latter, they attempt to motivate the worker by holding out a reward that is external to the significance of the work itself. Even when an attempt is made to include "politics, ideology, and style of work" in the criteria for assessment of individuals or groups, the fundamental nature of the appeal is necessarily to the desire for honor, prestige or fame—if not for advancement of one's career. Just as material incentives have been criticized for appealing to such desires, so have emulation campaigns: "Some people lump socialist emulation together with a championship mentality and putting rewards in command. * * *"[52] While there is evidence of ferment on the whole issue in China, emulation campaigns are at present still in use.

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[48] Ibid, p. 811.
[49] Howe, *Wage Patterns*, pp. 124–5.
[50] See Hoffmann, *Chinese Worker*, pp. 112–116 for a good discussion of these practices.
[51] FBIS 72–217, Apr. 8, 1972, p. D4.
[52] Chengtu broadcast of October 1972, FBIS 72–204.

TABLE 2.—WAGE GRADES, 1959 AND EARLY 1970'S (YUAN)

Industry or enterprise	Grade							
	1	2	3	4	5	6	7	8
Steel, Anshan I&S, 1959	34.50	40.74	48.11	56.82	67.10	79.25	93.59	110.40
Rough Rolling Mill, Anshan I&S, 1972	34.50	40.00	48.13	56.82	67.10	79.25	84.50	110.00
Machinery, Mukden Wks, 1959	33.00	38.90	45.80	54.00	63.60	74.90	88.20	104.00
Shenyang No. 1 Machine Tool Plant, 1972	33.00	38.90	45.80	54.00	63.60	74.90	88.20	104.00
Elec. Power, Hu-shun Statn, 1959	34.00	40.05	47.19	55.59	65.48	77.15	90.88	107.10
Coal, Fu-shun Mine, 1959	34.50	40.74	48.13	56.82	67.10	79.25	93.60	110.40
Petroleum, Northeast Petrol., 1959	34.00	39.88	46.78	54.88	64.36	75.48	88.54	103.70
Lumber, Forest Industries, 1959	33.00	38.61	45.17	52.85	61.83	72.34	84.64	99.00
Chemicals, Mukden Plant, 1959	33.00	38.61	45.18	52.87	61.84	72.37	84.68	99.00
Cereal, Mukden Flour Mill, 1959	29.00	34.00	39.90	46.80	54.90	64.40	75.40	
Construction, Fu-shun, 1959	33.66	39.95	47.43	56.28	66.82	79.44	92.40	
Peking No. 1 Machine Tool, 1973	34.00	41.10	47.50	55.00	61.10	77.10	90.90	107.10
Common heavy industries, Tsingtao, 1965	33.00	38.95	47.85	54.14	64.02	74.57	89.45	105.60
Heavy industries involving onerous duties, Tsingtao, 1965	36.00	43.20	52.20	63.00	79.00	90.00	108.00	129.60
Shin Wan Art Pottery, Foshan, Kwangtung, 1973	35.00	41.00	47.00	56.00	63.00	NA	NA	108.00

Sources: All 1959 figures are from "Chugoku Nenkan 1959 (China Yearbook 1959), Tokyo: Iwazaki Shuten 1960, p. 310, cited in Hoffman, "Chinese Worker," p. 101.

Figures for Peking No. 1 Machine Tool; common heavy industries, Tsingtao; and heavy industries involving onerous duties, Tsingtao, are from Hoffman, "Chinese Worker," pp. 98–99.

Figures for Shenyang No. 1 Machine Tool Plant; Rough Rolling Mill, Anshan Iron and Steel Corp.; and Shih Wan Art Pottery, are from A. Eckstein, "China Trip Notes," and R. Scalapino, "China, Wages and Prices, 1972," mimeo.

In the absence of piece rates, bonus systems or direct material inducements to model workers, virtually the entire burden of whatever material incentives operate within the State industrial enterprise in China today must be borne by the system of wage differentials, which still exists in keeping with the Socialist dictum, "to each according to his labor." Formally, these differentials are defined by standardized grade systems, usually (but not always) containing eight grades, and varying by industry (in reflection of skill requirements and heaviness of labor) and by geographic region (in reflection of cost of living differences). For many years now, these grade structures seem to have remained almost unchanged. Table 2 presents several recently obtained sets of wage grades and several from the late 1950's. It is evident that the wage grades in use at the Anshan Iron and Steel Corporation were virtually the same in 1972 as in 1959,[53] and that, similarly, the grades for the Shenyang No. 1 Machine Tool Plant in 1972 were identical to those of the Mukden Machinery Works (also in Northeast China) in 1959. Indeed, when the question of the formal wage structure arose during the Cultural Revolution, its reform was deliberately put off to a later stage. Visitors to the Peking No. 1 Machine Tool Plant in August 1972 were told that unsatisfactory characteristics of the wage spread there had still to be dealt with, and a Central Committee document of 1974 states that "since the immedaite task is to concentrate all strength to implement the Criticize Lin Piao, Criticize Confucius campaign, all those problems concerning wages and economic policies raised by the masses should be deferred to the latter stage of the campaign, to be resolved altogether after careful research and concrete analysis."[54]

[53] The one difference—in grade seven—may be due to the fact that the 1972 figures are for only one plant in the Anshan complex.

[54] Chung-fa 21 (1974) of the Central Committee, Chinese Communist Party, in *Background on China*, B 74–16, Dec. 3, 1974.

TABLE 3.—WAGE DIFFERENTIALS IN INDUSTRIAL ENTERPRISES, 1971–74

Enterprise	Basic monthly wage: Minimum	Basic monthly wage: Maximum	Basic monthly wage: Average	Maximum/minimum	Maximum/average	Average-minimum/maximum-minimum
Shanghai Plastic Materials No. 3 [1]	40	100	65	2.5	1.5	0.42
Shanghai Diesel Engine [2]	42	123	60	2.9	2.0	.22
Shanghai No. 3 Machine Tool [3]	42	123	66	2.9	1.9	.30
Shanghai Textile No. 31 [4]	36	108	70	3.0	1.5	.47
Shanghai Construction Machinery [5]	42	130	65	3.1	2.0	.26
Peking General Knitwear [1]	30	102	54	3.4	1.9	.33
Peking Glass (Australian dollars) [6]	(11)	(35)	(18)	3.2	1.9	.29
Peking Crafts [7]	33	99	60	3.0	1.7	.41
Peking No. 1 Machine Tool [5]	34	108	55	3.2	2.0	.28
Peking No. 3 Cotton Textile [7]	40	130	60	3.3	1.5	.22
Dairen Locomotive & Carriage [8]	33	104	70	3.2	1.5	.52
Dairen Shellcraft [8]	17	98	42	5.8	2.3	.31
Dairen Glass [8]	33	90	60	2.7	1.5	.47
Dairen Port [8]	30	85	60	2.7	1.3	.55
Shenyang No. 1 Machine Tool [8]	33	104	56	3.2	1.9	.32
Shenyang Heavy Machinery [1]	35	114	65	3.3	1.8	.38
Shenyang Transformer [1]	33	104	63	3.2	1.7	.42
Sian Textile Dyeing [9]	32	180		5.6		
Sian Handicrafts Workshop [10]	37	108	46	2.9	2.4	.13
Sian Electric Bulb [7]	41	91	50	2.2	1.2	.18
Tientsin Wool [3]	35	108	63	3.1	1.7	.39
Tientsin Watch [3]	34	108	50	3.2	2.2	.22
Tientsin No. 1 Carpet [3]	39	110	50	2.8	2.2	.15
Hangchow Silk Weaving [4]	32	90	62	2.8	1.5	.52
Hangchow Brocade Mill [1]	32	115	63	3.6	1.8	.37
Tsinan Pencil	35	60	45	1.7	1.3	.40
Tsinan Lathe No. 2	31	98	50	3.2	1.6	.28
Nanking Chemical Fertilizer	34	120	55	3.5	1.6	.24
Soochow Embroidery	30	80	40	2.7	2.0	.20
Tangshan: Kailan Coal Mine, Fangkechuang Pit [5]	43	125	85	2.8	1.5	.50
Tangshan: Kailan Coal Mine, Linhsi Pit [5]	33	102	77	3.6	1.6	.47
Anshan Iron & Steel [8]	34	114	67	3.4	1.7	.41
Canton: Ta Hsin Ivory Craft [8]	40	172	62	4.3	2.8	.17
Foshan, Kwangtung: Shihwan Art Pottery [8]	34	108	53	3.2	2.0	.26
Two county factories, Kwangtung [1]	33	100	45	3.0	2.2	.19
Fusun Coal Mines [11]		92	78		1.2	
Sample averages				3.2	1.8	.33

[1] Bettelheim, "Cultural Revolution and Industrial Organization in China." Data are for 1971.
[2] Ajit Singh, and Suzy Paine, "The Shanghai Diesel Engine Factory," mimeo. Data are for 1973.
[3] "Observations on the Chinese Economy," a report of a visit to China by five American economists, mimeo. Data are for 1973
[4] Alexander Eckstein, "China Trip Notes," mimeo. Data are for late 1972 and early 1973.
[5] "Collective Notes of the First Friendship Delegation of American Radical Political Economists to the People's Republic of China," mimeo, Data refer to 1972.
[6] "Australian Financial Review." May 1973.
[7] Provided by Professor Samuel Noumoff, McGill University. Data refer to 1974.
[8] Travel notes provided by Professor Audrey Donnithorne, Australian National University, Canberra. Data refer to 1973.
[9] Peking dispatch of Tanyug (Yugoslavia) correspondent S. Pucak, July 23, 1971, excerpted in BBC Summary of World Broadcasts, FE/3744/B/2, July 26, 1971.
[10] Travel notes provided by Professor Hugh Patrick, Yale University. Data for 1974.
[11] Report on Fushun Coalmine, in seven installments, beginning Jan. 28, 1974, in Hong Kong "Hsin-wan Pao."

It would be useful to know something about the actual wage spread—as opposed to the formal structure of wages—in Chinese enterprises. Information concerning maximum, minimum, and average wages in 37 Chinese industrial concerns during the years 1971 to 1974, is presented in table 3. It must be pointed out, however, that the manner in which these figures were given did not always make it clear whether the maxima and minima were actually paid wages or merely the extremes of the formal wage structure in the enterprises concerned.[55] The average gap between maximum and minimum wage in

[55] It should also be mentioned that two or more wage increases took place in some or all of the enterprises between 1971 and 1974, so that, strictly speaking, the sample is not entirely drawn from the same population. While probably not a very significant drawback for estimating the average overall wage gap, this fact might significantly affect a comparison of average wages in different enterprises in the sample.

the sample is 3.2–1 and the average gap between maximum and average wage is 1.8–1. The last column presents a measure of how far along the overall gap between high and low wage the average is located. The mean for the sample indicates that the average wage is one-third of the distance up from the minimum, suggesting that most workers are clustered in lower wage grades. Although the formal wage structure, and Chinese policy in the 1950's, called for generally higher wages in heavy industry, such a pattern is not readily apparent in table 3. Some of the highest maximum wages in the sample occur in light industries, such as the Sian Textile Dyeing Plant, the (Canton) Ta Hsin Ivory Craft shop and the Peking No. 3 Cotton Textile Factory. This is perhaps another indication of the current lack of reliance on relative wages for allocating labor among industries.

TABLE 4.—MAXIMUM WAGE OF MANAGERIAL CADRES, ENGINEERS OR TECHNICIANS (CET) AS PROPORTION OF ORDINARY WORKERS' WAGES, 10 ENTERPRISES, VARIOUS YEARS, 1971–74

	Maximum CET wage—		
Source [1] and enterprise	Average worker wage	Maximum worker wage	Minimum worker wage
H Shenyang No. 1 Machine Tool	2.3	1.3	3.9
H Anshan Iron & Steel Corp	[2] 3.0	[2] 1.8	[2] 5.9
A Shanghai Plastic Materials No. 3	1.7	1.1	2.8
A Peking General Knitwear	[2] 2.8	[2] 1.5	[2] 5.0
A Shenyang Transformer	3.6	2.2	6.8
B Shanghai Diesel Engine	3.7	1.8	5.2
D Shanghai Textile No. 31	[2] 2.9	[2] 1.9	[2] 5.6
J,C Shanghai No. 3 Machine Tool	3.0	1.6	4.8
E Kailan Coal Mine, Fangkechuang Pit	1.9	1.3	3.7
E Peking No. 1 Machine Tool	2.2	1.1	3.5
Sample average	[2] 2.7	[2] 1.6	[2] 4.7

[1] Source: Table 2.
[2] N.B. An entry when the maximum CET wage was given in a form such as "more than 200 yuan" or as an average top salary.

Engineers, managerial, and technical staff, and apprentices are not included in the wage scales presented in table 3. From a smaller sample of enterprises for which wage and salary data pertaining to the first two of these categories are available for 1971–74, I have calculated the ratios of the maximum such wage to the minimum, average, and maximum workers' wages (table 4). The first column gives an idea of how far above the average worker's wage is that of the highest paid employee in the enterprise. The mean such difference for the sample (something above 2.7–1) is consistent with Richman's findings in 1966.[56] The second column indicates that the top paid employees in the enterprises listed earn wages averaging about half again as much as the highest paid ordinary worker. This is a ratio with special sociopolitical significance, for it indicates to what extent occupational status differentiates income.[57] From this perspective, senior workers in the sample enterprises probably fare very well relative to technical and managerial personnel, by international standards. Moreover, it

[56] "At a majority of the enterprises surveyed, the ratio between the top pay and average enterprise pay was less than 2.5 to 1; the highest ratio—and this was a very unusual case—was about 4 to 1." Barry Richman, *Industrial Socity in Communist China*, p. 804. Richman's "average enterprise pay" probably includes high technical and managerial salaries, while mine pertains to ordinary workers' wages; this difference may partly explain Richman's somewhat lower ratio.

[57] Recall, however, that only the wage portion of total income is at issue here. Adding nonwage components would probably narrow the income distribution.

is my impression that the highest paid employees are usually engineers or others with advanced technical skills rather than managerial cadres. In several of the enterprises listed in tables 3 and 4, it was indicated that the leading members of the enterprise Revolutionary Committee earned wages commensurate with or below those of skilled workers.[58]

In 1966, Richman found that "at most enterprises the ratio between the director's salary and the average enterprise pay figure was less than 2 to 1, and the highest was only 3 to 1."[59] It can be surmised that a relatively large income gap between technically skilled personnel and ordinary workers is regarded in China as politically less onerous than one between managerial personnel and workers. The latter differential has more dangerous resonances because of the difference in relationship to the means of production of managers and workers. If those with managerial authority also enjoy substantially higher incomes, the threat arises that their station will take on aspects of class privilege.

Column three gives an indication of the overall wage gap between highest and lowest paid employees in the enterprises sampled, omitting however apprentices whose earnings are below the wage scale. The average overall span is seen to be on the order of 5–1.

The maximum wages of technical and managerial personnel used in table 4 are generally well below the theoretical maxima applicable to their positions, which, for chief engineers and high-level managers of large enterprises, range well above 300 yuan.[60] Such very high salaries are rarely encountered today, and seem to be reserved largely for holdovers from the old days whose high salaries will be retired with them. At the Shanghai Diesel Engine Factory in 1973, for example, although the highest technician's salary was 220 yuan, the current operative rates for Chairman of the Plant Revolutionary Committee were 60 to 70 yuan for a younger person, 100 yuan for an older one.[61] The high figure of 225 yuan for the Shenyang Transformer Factory in 1971 applied to only three older technicians out of 453, and the average technician's salary was put at 61 yuan, equivalent to an average worker's wage.[62] Although the practice of phasing out high salaries by attrition has created the anomaly of younger people of great accomplishment holding lower ranks and earning substantially less than older colleagues who are not better qualified, it also clearly negates the significance as a material incentive of still extant high salaries since these will not be applicable in the future.

A similar problem of very high salaries for the senior ranks exists in artistic and cultural circles. University faculty salaries have been reported to range up to 360 yuan per month at Futan University, 320 yuan at Liaoning University, and over 300 yuan at Chunghan University. This range was set in the early 1950's, and is now regarded as substantially too large and due for reform. As in the case of technical and managerial personnel in industry, a principal means of attacking

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[58] For example, visitors to a Shanghai machine tool factory in 1974 were told that a Deputy Chairman of the Plant Revolutionary Committee was paid 80 yuan per month, whereas some engineers got 200 yuan and the top worker s wage was 124 yuan.

[59] *Industrial Society*, p. 805.

[60] Richman, *Industrial Society*, p. 799; Hoffman, *Chinese Worker*, pp. 102–103.

[61] Ajit Singh and Suzanne Paine, "The Shanghai Diesel Engine Factory," manuscript, 1973.

[62] Bettelheim, *Cultural Revolution and Industrial Organization in China*, p. 16. The particularly low average for technicians here was due to the large number of younger people in their ranks.

the problem at present seems to be to refrain from promoting junior faculty even when they have the qualifications.[63] One report from Peking refers to a general scaling down of artistic and cultural salaries to approximate parity with the wages of industrial workers, so that, for example, a young prima ballerina in Sian would receive 45 yuan per month, slightly more than a skilled worker of her age.[64] If present trends continue, therefore, the upper extreme of the income distribution in China is likely to shrink substantially over the next few years.

What about the lower extreme? For the country as a whole, this is still to be found in the agricultural incomes of the poorer regions. But within industry, the lowest paid workers are the apprentices, who are assigned to a factory directly upon graduation from junior or senior middle school. Their terms of apprenticeship are generally 2 to 3 years, after which they are promoted into a regular wage category that may be as high as grade two.[65] Apprentices' wages reported by recent visitors to China range from a low of 14 yuan per month at the Soochow Embroidery Factory [66] to a high of 40 yuan at the Peking Arts and Crafts Factory.[67] A common range seems to be from 17–18 yuan for the first year to 22–24 yuan for the third year. In addition, apprentices receive a clothing allowance and are covered by the same welfare provisions as ordinary workers. In Peking, for example, where the minimum per capita income necessary to cover living expenses is estimated to be about 12 yuan per month, workers whose incomes are insufficient to meet this standard for their families are provided with an additional allowance.[68] Apprentices would be eligible for such coverage, although most apprentices are below the currently recommended age of marriage and would not have dependents to support.

When the need arises, workers are asked to work overtime but it seems they are generally not given overtime pay. Indeed, overtime pay is sometimes equated with "awards" of the sort that were repudiated in the Cultural Revolution. Thus, in a casting workshop of the Shanghai No. 5 Iron and Steel Plant, workers suggested that leftover molten steel be used to cast small ingots:

> One of the workshop leaders thought the suggestion was very good but was afraid that the workers might be unwilling to take up the "extra" job. So he planned to introduce it by giving awards. (A young worker) pointed out in his character poster that instead of arousing the workers' enthusiasm by political and ideological education, "awards" were now considered as a means to trigger the workers' "fervor." This could only mean "fervor" which was capitalist in essence. This is what we repudiated during the great proletarian cultural revolution. This measure was a slipping back. The leadership should bring into play the workers' enthusiasm for building socialism by telling them about the needs of the revolution.

The young worker's position prevailed and the work was done without "awards." [69]

Since the standard wage categories have remained unchanged for many years, and bonuses, piece rates, and other special incentives are

[63] This last information, which refers specifically to Futan University, comes from the notes of Professor Hugh Patrick of Yale University.
[64] From a Peking dispatch by Tanyug (Yugoslavia) correspondent S. Pucak, broadcast on July 23, 1971. BBC Summary of World Broadcasts, FE/3744/B/2, July 26, 1971.
[65] Hoffmann, *Chinese Worker*, p. 68.
[66] Information obtained from Professor Sam Noumoff of McGill University.
[67] A. Eckstein, "China Trip Notes," p. 40.
[68] Bettelheim, *Cultural Revolution and Industrial Organization*, p. 15.
[69] *New China News Agency*, Jan. 2, 1975, p. 10.

no longer employed, the actual money earnings of a worker are determined almost exclusively by his wage classification. To the extent that assignment to a particular wage grade depends on skill and productivity, a material incentive can certainly be said to exist for workers to upgrade their skills and to work with diligence. The available descriptions of the general criteria for assigning workers, including skill, length of experience, difficulty of job, attitude toward work, productivity and general performance,[70] are sufficient only to suggest that such an incentive exists; to know how important it is, we would have to know far more about the relative emphasis given to the various criteria, and the manner in which they are applied. In at least some enterprises, each worker's qualifications are assessed by the masses, whose judgments are then subject to leadership approval. Are the workers anxious to reward exemplary performance readily with promotion in grade? Or, do they emphasize the virtues of a stable and predictable income and thus give most consideration to work experience (seniority), as long as the minimum satisfactory standards of productivity are met? At present, all that can be said is that the existence of wage differences tied at least partly to productivity and skill, and of differences between the wage scales of ordinary workers and technical personnel, preserves a system of material incentives backing up other factors that motivate industrial workers to achieve higher productivity and improve their qualifications.

There are, however, general limitations in this system which make it unlikely to play a very sharp material incentive role. First, wage grade assignments are made on a fairly long-term basis and do not change from day to day in response to fluctuations in worker productivity. Second, it is probably difficult (and therefore unusual) for a worker to be demoted in grade, the way the nonaward of a bonus or a decline in income under piece rates automatically demotes when productivity falls. Third, educational and training costs are mostly borne by the state or the enterprise, so that the strong cultural value of education as well as its independent worth as a "consumption good" should provide a healthy incentive to upgrade one's skills without the need for much additional incentive in material form.[71] Finally, the actual differentials seems to be narrowing, not only because of the phasing out by attrition of the highest salaries and wages, but also because of the nature of recent wage increases. After a period of rapid growth during the 1950's, the real wages of Chinese workers and staff members appear to have declined during the years following the Great Leap, and then to have remained rather stable through the 1960's.[72] Beginning in 1971, a series of increases have taken place, affecting as much as 40 percent of the workers in individual enterprises.[73] In most if not all cases reported, the raises affected workers in the lower wage grades, invariably by moving them up to a higher grade. Thus, in the Peking Arts Factory, workers in ranks 1 through 4 were promoted sometime before the end of 1972; [74] in the Tientsin Wool Factory, 180

[70] Richman, *Industrial Society*, p. 803; also, Singh and Paine, "Shanghai Diesel Engine Factory;" and "Observations on the Chinese Economy," p. 85.

[71] Bettelheim (*Cultural Revolution and Industrial Organization*, p. 16) states that, while the length of courses offered by factory schools varies with the material taught, it takes only 2 years for an experienced worker to qualify as an engineer.

[72] Howe, *Wage Patterns*, pp. 31–35.

[73] Trip notes of Audrey Donnithorne. Professor Donnithorne was told that 40 percent of the workers in the Ta Hsin Craft Factory in Canton received wage increased in 1972.

[74] A. Eckstein, "China Trip Notes," and R. Scalapino, "China—Wages and Prices."

workers were advanced from grade 1 to grade 2 in 1971, and 64 moved up from grade 2 to grade 3 in 1973; and similar kinds of increases were reported for Tientsin No. 1 Rug Factory, Tientsin Watch Factory, and Shanghai No. 3 Machine Tool Factory.[75] There is evidence of continuing demand for higher wages by some Chinese workers in 1974, and for the granting of such increases.[76] By promoting the lower ranks and reducing overall wage differentials, such developments reduce the importance of these differentials as a source of stimulus to worker performance.

In sum, it would seem that the scope for the operation of material incentives within Chinese industrial enterprises is quite limited. Such typical incentive devices as differential bonuses, piece rate mechanisms, and material awards to emulation campaigners, have been ruled out since the Cultural Revolution. Significant wage and salary differences, both between technicians and workers and among workers of different levels of productivity and skill, continue to exist. But they are gradually being narrowed, and their incentive effect on worker performance seems quite constrained even at present.

Conclusion

Our general survey of incentives and wages in Chinese industry today has found that urban-rural differences still provide a reason for Chinese to become industrial workers; that horizontal allocation of labor within industry is done without much reference to material incentives; and that wage differentials tied to occupation and skill stimulate work performance and skill acquisition only in a limited manner. Together, these conclusions suggest that the explanation for the morale and motivation of Chinese workers is not, on the whole, to be found principally in material incentives as ordinarly conceived. Other external incentive mechanisms of a nonmaterial sort (emulation campaigns in particular) play a role, but one that must be limited by the current deemphasis of extreme competitiveness ("championship mentality"), by the ideological ambiguity of such campaigns and by the token nature of the awards. Moreover, the value to workers of the stature won in emulation campaigns depends in part on the value to them of the system awarding it. But this is an issue of internal incentives, whose importance in Chinese industry we turn to briefly examine last.

Internal incentives arise from the intrinsically satisfying nature of a job, or from the worker's identification with the objectives and significance of the work. The former kind is frequently associated with the opportunity to exercise craftsmanship and valued skills. Its decline in the industrially advanced countries, due to the extreme subdivision of labor into repetitive and monotonous tasks, has been associated with much worker dissatisfaction. Have the Chinese tried to avoid this problem in their developing modern industries by designing technologies and work methods that incorporate a more challenging role for the worker? Most observers feel they have not, that the issue is one to which they have shown no great sensitivity in responding to queries,

[75] "Observations on the Chinese Economy."
[76] See, e.g., the article by Paul Strauss in the *Journal of Commerce*, Sept. 6, 1974.

or in the technologies of plants actually observed.[77] One writer states that the Chinese have failed to popularize the work in which Marx most extensively discussed "alienation" (the "Economic and Philosophic Manuscripts" of 1844) and that as a result "Chinese writers do not draw on Marx's insights about the state of mind of the worker participating in a fragmented job." [78]

Two qualifications must be made to the above conclusion. The first concerns the encouragement of technical innovations by workers, particularly in the organizational context of the "three-in-one combination teams" that emerged from the Cultural Revolution. Together with the links established between education and production work and the encouragement of worker education, this development paves the way for increasing numbers of workers to achieve greater mastery of the technology to which they are tied, and clearly constitutes a form of "job enlargement." [79]

The other qualification leads us to consider the second aspect of internal incentives mentioned above (the worker's identification with the objectives and significance of the job), because it concerns the degree to which workers share authority over the decisions that affect them, such as those concerned with production planning, specification of tasks, cost control, investment planning, establishment of work and safety rules, allocation of the welfare fund, et cetera. Clearly, an authentic participation in such decisions can be thought of as countering job fragmentation, but the issue is larger than this.

The construction of new forms for industrial management in which "bourgeois authority" would be reduced, status differentials eroded, and workers armed with substantial influence over enterprise decisions, has been a major aspect of Chinese Communist industrial policy since the Great Leap Forward of the late 1950's, although progress has been halting and sometimes reversed. A variety of such forms, including workers' management teams, workshop and team assemblies and worker representation on enterprise revolutionary committees, emerged with still unknown degrees of longevity from the Cultural Revolution. The social relationships these forms must come to grips with, together with the systems of ownership and distribution, comprise the "relations of production," and Chinese Marxists consider them to be interconnected:

> we must consolidate and develop socialist ownership by the whole people * * *, prevent the restoration of the bourgeois right already liquidated with regard to the system of ownership * * * and at the same time restrict bourgeois right with regard to the two other aspects of the relations of production, namely, the relations between men and the relations of distribution. * * * [80]

The interdependence of these different components of the relations of production is easily seen. An erosion of status differentials separating workers and managers, for example, would weaken the legitimacy

[77] For example, Suzanne Paine and Ajit Singh on the Shanghai Diesel Engine Factory: "We discovered that there was no radical approach to improving the actual content of manual work away from monotonous and repetitious production line operations. Younger workers were moved around to some extent but older workers remained on the same job all the time."

[78] Donald J. Munro, "The Chinese View of 'Alienation,'" *The China Quarterly*, No. 59 July–September 1974, pp. 581–82.

[79] See Bettelheim, *Cultural Revolution and Industrial Organization*, ch. 3, for an interesting discussion of this issue in relation to diminishing the dichotomy between mental and manual labor.

[80] Yao Wen-yuan, "On the Social Basis of the Lin Piao Anti-Party Clique," Hsinhua News Agency, Mar. 2, 1975, p. 19.

of wide income disparities based on status; thus, the tendency discussed earlier for the extremes of the wage gap to narrow is consistent with attacks on enterprise hierarchy during the Cultural Revolution. And if income distribution is tied to broader issues concerning the relations of production, so must incentives be. Indeed, a close study of Chinese factory management in the early 1960's reveals just such a link; as the bolder experiments with "participation, equality, and collective advancement" of the Great Leap gave way to tighter control, less participation, and an increasing amount of enterprise hierarchy, so concurrently did individual material incentives come to the fore, especially piece rates and awards of various kinds.[81] It is likely that the subsequent evolution of the individual management system would turn up similar correlations.

Thus, having been led to anticipate an important role for internal incentives in industry by the relative weakness of external ones, we are finally drawn to the conclusion that their function can hardly be distinguished from that of other institutional features of the "continuing revolution" in China. It seems that the clue to the motivation of the Chinese worker, as to that of any other, is ultimately to be found in the threads that bind him to society.

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[81] Stephen Andors. "Factory Management and Political Ambiguity, 1961–1963," *The China Quarterly*, No. 59, July–September 1974, esp. pp. 456–461.

THE CHINESE PETROLEUM INDUSTRY: GROWTH AND PROSPECTS

By Bobby A. Williams

Conclusions

The emergence of the People's Republic of China as a major oil producer and oil exporter is a recent phenomenon. Prior to 1949, Chinese petroleum output was insignificant. As part of its general program of building up industrial strength and reducing dependence on foreign sources of supply, the new government undertook an intensive exploration and development effort in the oil industry. The payoff was the discovery in 1959 and the subsequent rapid development of the huge Ta-ch'ing oilfield in Manchuria's Sung-Liao Basin. Additional large discoveries—in the North China Basin in particular—have eliminated the PRC's dependence on foreign oil, insured an abundant supply of oil for the modernization of the Chinese economy, and enabled Peking to export sizable amounts of oil, beginning in 1973.

The salient points in this study are as follows:

China produced 65 million tons of crude in 1974 and was the world's 13th largest producer, just behind Indonesia.

Proved reserves are conservatively estimated at 1.1 billion metric tons. Proved plus probable reserves are estimated at 5.9 billion metric tons and could easily be 7.6 billion metric tons. Offshore reserves will add appreciably to these estimates.

Current exploration is concentrated in existing fields and in the Pohai Gulf. At least three jack-up rigs and perhaps a semi-submersible are working in the Pohai.

Exports of crude rose to more than 4 million tons in 1974 and should exceed 8 million tons in 1975, earning the Chinese more than $700 million.

In 1974, oil accounted for 17 percent of the primary energy produced in China, up from 2 percent in 1957 and 11 percent in 1970. Industry and transportation are the largest consumers of petroleum. Agriculture is consuming a rapidly growing share, up from 9 percent in 1957 to 15–20 percent today.

China is the world's fifth largest producer of natural gas. Output in 1974 was approximately 60 billion cubic meters, 52 billion cubic meters of which was produced in Szechwan Province.

Refining capacity at mid-year 1974 is estimated at up to 47 million metric tons. The industry, whose technology is comparable to Western refining industries in the late 1950's, satisfies China's product needs.

Since 1970, the People's Republic has added almost 2,000 kilometers of new pipeline, largely to facilitate oil exports, and has invested heavily in port and handling facilities and tankers.

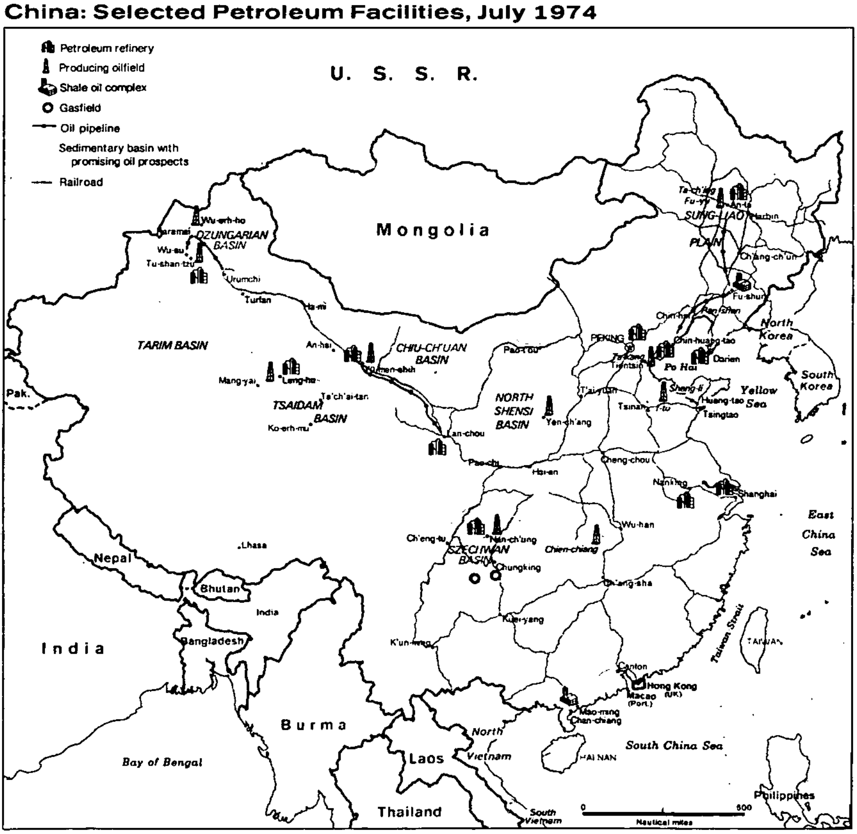
By 1980, China should be producing more than 200 million tons of crude oil annually of which approximately 50 million tons may be exported.

Peking is unlikely to allow foreigners to participate extensively in the development of its oil resources. For the foreseeable future, dealings with outsiders will be limited to straightforward purchases of equipment, technology, and services.

Introduction

The recent emergence of the People's Republic of China as a major world oil producer has been exceptionally rapid. Because of Chinese reticence regarding the publication of basic statistics on its oil industry, the information necessary for a detailed explanation of this rapid development is sparse. Nevertheless, a thorough review of the available material on Chinese oil developments provides good grounds for assessing the progress of the industry. This paper begins with a historical survey of oil developments in China from the prewar years to the present. The following sections of the paper discuss PRC reserves and current exploration efforts, trends in the oil trade and consumption patterns, the PRC natural gas position, the status of refining, and developments in the transportation network for oil in China. The paper concludes with an appraisal of PRC oil prospects particularly as they relate to export policy.

China: Selected Petroleum Facilities, July 1974



Historical Survey

Pre-1949 [1]

Throughout the pre-1949 period, annual production of crude oil in China rarely exceeded 100,000 tons and 85–90 percent of the country's needs were met through imports. Prior to the war with Japan (1937–45), annual imports of petroleum products—mostly kerosene—amounted to about 700,000 tons. During the war, oil imports rose to more than 860,000 tons annually, and in 1948 more than 1 million tons were imported.[2]

The drilling of an oil well at Yen-ch'ang in northern Shensi Province in 1907 marked the beginning of China's modern petroleum industry. Oil was later discovered in other provinces—notably in Szechwan, Kansu, Sinkiang, and Tsinghai. These early discoveries were of limited commercial value: they were located deep in the interior of the country, away from the major industrial and population centers of the East and without access to economical transportation. Standard Oil Co., in a report on the Shensi and Szechwan fields issued in 1920, estimated reserves at 188 million tons.

By the early 1930's, however, little progress had been made. Yen-ch'ang—although producing less oil than other fields—remained the only oil field in China where modern production techniques were being used. Yen-ch'ang's two wells produced 76 tons of crude oil in 1931; 3 years later, in 1934, output had fallen by half, and Szechwan had become China's largest source of natural crude oil, producing 55 tons.

Reflecting the putative lack of natural oil reserves and the relative abundance of coal and oil shale, most of the oil produced in China in the 1930's was synthetic oil, produced from coal and oil shale. In China proper (excluding Manchuria) a coking plant at Shih-chia-chuang, Hopeh Province, produced an average of 260 tons of synthetic oil annually, 1931–34—70 percent of the oil produced outside Manchuria. Compared to the amount of synthetic oil produced in Manchuria, output at the Hopeh plant was insignificant. Three Japanese synthetic oil plants in Manchuria produced an average of 78,000 tons of crude oil during 1931–34 and accounted for more than 99 percent of China's total annual oil output. One plant alone, the Fushun Shale Oil Plant, produced 95 percent of China's oil.

By the late 1930's several petroleum geologists had expressed doubt that China would ever become a large oil producer. Eliot Blackwelder in 1922 had written: "The writer (Blackwelder) will venture only the opinion that China will never produce large quantities of oil * * *" [3] In 1938, M. L. Fuller and F. G. Clapp—two Standard Oil geologists who had explored in China during 1913–15—concluded that: "A large part of the Chinese Republic consists of rocks of types and ages in which no possibility of commercial oil deposits exists." [4]

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[1] This section is based primarily on information in *China Handbook 1950*, New York, 1950, pp. 404–411; *The Chinese Yearbook, 1937 Edition*, Shanghai, 1937, pp. 744–746; *The Chinese Yearbook 1944–45 (seventh issue)*, Shanghai, 1944, pp. 647–648; *China Handbook 1937–45*, New York 1947, pp. 390–391.

[2] Y. I. Berezina, *Toplivno-Energeticheskaya Baza Kitayskoy Narodny Respubliki*, Moscow, 1959, translated in *Joint Publication Research Service*: 3784, Aug. 31, 1960, pp. 44–45 (hereafter cited as JPRS).

[3] Yen Erh-wen, "Oil to Dominate Old China," *China Reconstructs*, April 1966, p. 16.

[4] *Ibid.* This opinion can also be seen in standard geography texts on China; see for example George B. Cressey, *Land of the 500 Million: A Geography of China*, New York, McGraw-Hill, 1955, p. 138.

This pessimism may have waned somewhat when oil was discovered at Yu-men, Kansu Province in 1937. Production began in 1939, and by 1944, 18 wells produced approximately 69,000 tons of crude oil, which was refined in two small refineries located nearby. By then the disruptions of war had begun to affect the oil industry. Crude oil output reached its pre-1949 peak of 321,000 tons in 1943; in 1948 it fell to 90,000 tons.

The oil industry inherited by the Chinese Communists thus was extremely small. Surveys had established that China had some oil reserves, mostly shale, but there had been little development of this potential. The deposits of natural crude that had been discovered were, because of their location and lack of economical transportation, of little commercial value. The shale deposits, although more favorably situated, were costly to produce. Postwar cannibalization of facilities in the Northeast was a further blow to the industry.[5]

The facilities acquired by the new government included the Yu-men oilfield and refinery, the small Yen-ch'ang oilfield and its primitive refinery, the abandoned facilities for production in Sinkiang, two natural crude oil refineries in Manchuria, and a very small distillation plant in Shanghai. The facilities for the production of synthetic petroleum, all located in Manchuria, consisted of two large shale oil plants at Fu-shun and several small plants for the production of oil from coal. Some of the latter were completed near the end of WWII and had not been operated.

From the point of view of the Chinese Communist Party, the legacy of "old" China was not the development of China's petroleum industry, but the exploitation of the Chinese market by Japan and the large international oil companies of the United States and Great Britain:[6]

TABLE 1.—*China: Oil output*

	Millions of metric tons		*Millions of metric tons*
1943	0. 321	1962	5. 8
1949	0. 121	1963	6. 4
1950	0. 200	1964	8. 7
1951	0. 305	1965	10. 8
1952	0. 436	1966	13. 9
1953	0. 622	1967	13. 9
1954	0. 789	1968	15. 2
1955	0. 966	1969	20. 3
1956	1. 163	1970	28. 5
1957	1, 458	1971	36. 7
1958	2. 264	1972	43. 0
1959	3. 7	1973	54. 5
1960	5. 5	1974	65. 3
1961	5. 3		

Sources and derivation:

1943, 1949–58: State Statistical Bureau, *Ten Great Years* (Peking, 1960), pp. 103 and 95.

1959: Jen-min Jih-pao, 23 Jan. 1960.

1960: Japan Petroleum News, Vol. 5. No. 1248, 8 July 1965. This figure apparently is from a Soviet source; see *Far Eastern Economic Review,* 10 Jan. 1963, p. 51. An output of 5.5 million tons would square with the announcement that the Second Five-Year Plan (1958–62) target was met two years ahead of time—the target was for 5 to 6 million tons. See *China Reconstructs,* Apr 1963, p. 6. However, note that Li Fu-ch'un in his report to the National People's Congress on 30 Mar 1960 announced a target of 5.2 million tons for 1960. See FBIS, 31 Mar 1960, p. 16.

1961: Derived from the output figure for 1962 and the announcement that crude output during the first 11 months of 1962 was up by 10.3 percent over the same period of 1961. See *Chung-kuo Hsin-wen,* Canton, 14 Dec 1962. *China Reconstructs,* Apr 1963, p. 6, gives a

[5] John K. Chang, *Industrial Development in Pre-Communist China,* Chicago, Aldine, 1969, p. 82.

[6] Yen Erh-wen, *op. cit.,* p. 15.

For three-quarters of a century before today's socialist China came into being, the United States and British oil monopolies dumped their products into our country at enormous profit, ruthlessly interfered in our internal affairs, and used their oil as a club over the heads of the Chinese people. "No possibility of commercial oil deposits exists," they said of China as they tightened their economic and political domination.

Sources and derivation—Continued.
figure of 10.8 percent for all of 1962, but this figure appears to be for the growth of gross value product for the entire petroleum industry, not for crude oil output.

1962: Japan Petroleum News, Vol. 5, No. 1248, 8 Jul 1965.

1963: 1971/63 (output in 1971 divided by output in 1963) equals 5.77, in *Jen-min Jih-pao,* 27 Sep 1972; translated in *Survey of China Mainland Press* 72–41, Oct. 10–13, 1972, p. 124. The actual statement was that the average annual growth rate of crude oil production for 1963–71 was 24.5 percent.

1964: Premier Chou En-lai, at the Third National People's Congress, reported that the output of petroleum would increase by "more than 20 percent" over 1963. NCNA—Peking, 30 Dec. 1964. In 1975, he announced that output in 1974 was 650 percent higher than in 1964 (FBIS, 20 Jan 1975, D–21). Output in 1974 is estimated at 65.3 million.

1965: 1969/65=1.88, in *Economic Reporter,* October–December 1973, p. 24; also, 1972/65=4.0, in FBIS, *Daily Report: People's Republic of China,* 5 Sep 1973, p. B–10.

1966: NCNA–Peking, Sept. 26, 1966 reported that output for the first 8 months was up by 28.4 percent over 1965.

1967–1968: The lack of yearend growth figures for crude oil output and disruptions to production and/or transportation associated with the Cultural Revolution—which render extrapolation on partial-year data particularly difficult—make the estimates for 1967 and 1968 the least accurate of the estimates presented here. Since any attempt to estimate crude oil output for 1967 and 1968 involves making entirely arbitrary assumptions, I have used what I consider the simplest possible methodology. The data on which the estimates are based are presented below, followed by a description of the methodology used.

A. "The output of oil and oil products in the 9 months between January and September (1967) surpassed the corresponding period of 1966, which was itself a year of tremendous increase over 1965."—*China Pictorial,* 3, 1968, p. 39.

B. "Output of crude oil and refined oil products for the first 8 months of this year surpassed the state targets. Crude oil output was 34 percent and output of refined oil products 43 percent higher in August than in January. Average daily output of crude oil in some oil fields rose 40 percent last month compared with the period before the Cultural Revolution. More gasoline, kerosene, diesel oil, and paraffin were produced in the first 8 months of 1968 than in the corresponding period of the record output year of 1967."—FBIS, Sept. 27, 1968, B–3.

C. "In the first quarter of 1969, crude and refined oil output are respectively 64 and 51 percent above that of the corresponding period of 1968 . . . Shale oil output topped the quota for the first quarter by 31 percent . . . Their (Ta-ch'ing's) crude oil production, which surpassed their quotas for the first quarter, is a new Ta-ch'ing quarterly record. The volume of crude oil transported from the oil field and crude oil processed are 84 and 37.9 percent above that of the same period last year . . . Output (at Yumen) for this quarter was 46 percent above the corresponding period of last year . . . Ta-ch'ing oil field's workers hit an all-time monthly production high for the field in March, and production of crude oil and refined oil was 62.4 and 28.2 percent over what it was in March last year."—FBIS, Apr. 24, 1969, B–1.

1967: For 1967, I assume that output in the first 9 months was 5 percent higher than in the corresponding period of 1966; 5 percent is chosen because statement A appears quite modest. This gives an output of 10.9 mmt during the first 9 months. The output rate in the final 3 months is assumed to be equal to that of January 1968, which I estimate at an annual rate of 11.9 mmt (see below)—or 3 mmt for the 3-month period. Thus total output for 1967 is estimated at 13.9 mmt. Note that reference B refers to "the record output year of 1967". This does not necessarily mean that the above estimates, rounded to one decimal place, are wrong; one should, however, be aware of this possibility.

1968: Assuming that growth in 1969 occurred at an even rate, output in the first quarter of 1969 was at an annual rate of 20.3 million metric tons. This was (according to C above) 64 percent higher than in the first quarter of 1968, which thus was at an annual rate of 12.4 mmt. Output in August 1968 was 34 percent higher than output in January (B above); thus between January and August, crude output grew at a monthly compounded rate of 4.3 percent. If the annual rate of output for the first quarter of 1968 was 12.4 mmt, then output in January was at a rate of 11.9 mmt—since 12.4=½ (January output rate +1.088 January output rate) and where 1.088 times the January output rate is the output rate of March. I assume that output in 1969 continued to grow at the rate of January to August, i.e., 4.3 percent monthly. Calculating the approximate area under the curve thus generated, one can estimate output in 1968 at 15.2 mmt, or 9.4 percent higher than in 1967 and 33.6 percent below output in 1969.

1969: 1970/69=1.409, in *Peking Review,* 47, 24 Nov 1972, p. 17.

1970: 1971/70=1.286, in *Ibid.* Revised upward from previously announced 27.2 percent increase.

1971: Mainichi Shimbun, 22 Dec 1973; also, *Peking Review,* 39, 29 Sep 1972, p. 12, reported that crude oil input in 1971 had increased by "more than 300-fold" over 1949 (1949 output was 121,000 tons). Note that 36.7 divided by 0.121 is 303.3.

1972: Ibid. However, note that a 16 percent growth rate was announced in British Broadcasting Corporation, *Survey of World Broadcasts, Far East,* W706, 10 Jan 1973, p. A/7. Presumably the 17.2 percent increase represented by the figures given in *Mainichi* is a revised figure.

1973: NCNA on 12 Sep 1973 announced that "In August the average daily output of crude oil was more than 20 percent higher than in Dec 1972." See FBIS, 19 Sep 1973, p. B–5. The figure here is derived by dividing 1974 output by 1.2. The derived figure implies a growth rate of 26.7 percent for 1973.

1974: Crude output in 1974 increased by 20 percent; it was "more than six times that of 1965" (FBIS, 3 Jan 75, p. E–10). I assume that 1974 was 6.05 times 1965 output (10.8).

> But China rose in revolt against the bullying of imperialism and the treachery of its internal allies. Swept out with the trash were the robber oil companies and their foreign oil. China will never produce oil, they had said. The Chinese people proved them wrong.

This interpretation of China's past is of more than historical interest. China's current opposition to joint or cooperative development of her oil resources has as its source, at least in part, the real or imagined unsavory practices of the international oil companies of that era.

1949–52

Until the First Five-Year Plan (1953–57), activity in the petroleum industry was directed toward the rehabilitation and restoration of existing facilities. The government concentrated on restoring to operation those facilities that could be rapidly brought into production. The two obvious facilities were the Yu-men oil field and Northeast Petroleum Plant No. 1 at Fu-shun. Both of these installations had suffered from wartime operation in excess of designed or optimal capacity and from inadequate maintenance. By 1950, Yu-men had surpassed its previous peak production, and by the end of 1952 restoration of Northeast Petroleum Plant No. 1 was completed. Concurrently, the small facilities for producing natural crude oil at Tu-shan-tzu in Sinkiang Province and at Yen-ch'ang in Shensi Province were restored to partial operation, as were the small synthetic oil plants at Hua-tien and Chin-chou in Northeast China. The natural crude oil refinery built by the Japanese at Dairen was operated during this period on crude oil imported from the U.S.S.R.

Aside from restoration the Chinese used these years to study the potential of the industry and to prepare for its expansion under the First Five-Year Plan. These was no sizable investment in the industry, and little effort was directed toward the development of new resources. Through the restoration and improvement of existing facilities, however, the Chinese increased crude oil production from 121,000 tons in 1949 to 436,000 tons in 1952, surpassing the peak of 321,000 tons established in 1943.[7] Imports from the U.S.S.R. during this period accounted for 50–70 percent of the petroleum consumed in China (see table 1 in Appendix B).

1953–57: First Five-Year Plan

China's First Five-Year Plan (FFYP) called for the transformation of China "from a backward, agricultural nation to an advanced socialist, industrialist state."[8] The petroleum industry was described as being in a "particularly backward state", and it was acknowledged that at the end of the plan period the oil industry would still be "far from being able to supply the needs of the national economy."

The plan for the petroleum industry focused on exploration for additional natural crude oil reserves.[9] Exploration and drilling were to be "energetically" pushed forward in Kansu, Sinkiang, Szechwan, and Tsinghai Provinces. The rate of drilling in 1957 was to be 7.3

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[7] See table 1.

[8] *First Five-Year Plan for Development of the National Economy of the People's Republic of China in 1953–57*, Peking, Foreign Languages Press, 1956, p. 13 (hereafter cited as *First Five-Year Plan*).

[9] *Ibid.*, p. 73.

times that of 1952, and over the 5-year period 55.18 million tons of natural crude oil were to be added to China's known reserves.

Productive capacity of existing oil wells in the Northwest, especially at Yu-men, was to be rapidly increased; the output of crude oil in the oilfields of Sinkiang was also to be increased and the exploitation of new oilfields begun. By 1957, the productive capacity of crude oil throughout the country was to be 4.2 times the 1952 figure. Existing equipment for extracting oil from shale and coal at Fu-shun and other places was to be fully utilized, and the productive capacity of synthetic crude oil in 1957 was to be 2.6 times that of 1952.

Refining capacity was also to increase. A "huge" modern oil refinery was to be built and existing refineries restored or reconstructed; by 1957, refining capacity was to be 2.5 times that of 1952.

In the 5-year period, crude oil output was to increase at an average rate of 35.8 percent and in 1957 was to be 4.6 times the amount of oil produced in 1952. But, given China's continuing requirement for oil imports, "the state must initiate measures to effect economy in the use of oil and to encourage the use of its substitutes, and these must be strictly enforced throughout the country."

To carry out these plans the Chinese allocated more than half of the 1.9 billion yuan invested in the petroleum industry during 1953–57 to exploration.[10] As a result, proved reserves increased from less than 30 million tons of natural crude oil to more than 100 million tons in 1957.[11]

Output of natural and synthetic crude oil during the FFYP grew from 436,000 tons in 1952 to 1.458 million tons in 1957—short of the goal of 2 million tons but still constituting average annual growth of 27.3 percent. The production of natural crude oil grew from 195,000 tons in 1952 (45 percent of total) to 850,000 tons in 1957 (58 percent).[12] Despite this growth, almost 1.4 million tons of petroleum were imported annually from the Soviet Union.[13] Imports as a percentage of total petroleum supply remained virtually unchanged over the period (58 percent in 1952; 55 percent in 1957).

1958–62: Second Five-Year Plan

The Chinese clearly were dissatisfied with the progress of the petroleum industry during the First Plan. In spite of rapid growth in crude output, petroleum imports remained high and commanded a large share of China's foreign exchange. At a conference held at Yu-men, Vice Minister of the Petroleum Industry K'ang Shih-en complained about the costly and time-consuming search for large oil deposits and explained the approach to be taken in the Second Plan period.[14]

> In the past we placed our hope on the big oilfields and the high production and naturally flowing wells, but we hoped against hope for 8 years and nothing happened. In 1957 the production of natural oil was only about 800,000 tons. We can-

[10] *Chi-hua Ching-chi* (Planned Economy), No. 12, 1957, pp. 12–15. The yuan-dollar ratio in the 1950's was roughly 2.4 :1.

[11] K. C. Yeh, *Communist China's Petroleum Situation,* Rand Corp. Memorandum RM-3160–PR, 1962, p. 29.

[12] *Ibid.*, p. 5.

[13] See appendix B, table 1.

[14] *Shih-yu K'an-t'an* (Petroleum Exploration), No. 15, 1958, pp. 3–9; translated in JPRS: 1478–N, Apr. 13, 1959, pp. 4ff.

not afford to wait anymore. Henceforth, we need the big oilfields but we also need the small ones. We should develop the big and the small fields without exception. For the time being, we would do well to develop the small and shallow ones, and make greater use of native methods. At the same time, we should not neglect the big and deep wells and the use of foreign drilling methods.

Shallow oil-bearing strata were widespread throughout China, and whereas drilling an 1,100-meter exploratory well at Yu-men, using modern methods, cost 195 yuan a meter, the use of native methods to drill to depths of 200-400 meters cost only 3 to 5 yuan per meter.

This matter can be handled by the cooperatives and, within 5 years, it will be easy to open several tens of thousands of wells. On the basis of an annual yield of 20 tons per well, 100,000 wells will produce 2 million tons of crude oil a year.

A similar approach was to be taken in the synthetic oil industry: small local plants producing 300 tons annually were to supplement the output from the large modern plants—thus helping to insure that by 1962 the goal of producing one ton of oil for each ton of steel produced would be met.

This policy, like others based on the "mass line" of the Great Leap Forward, was short-lived. Halfway through the Second Plan period, policy for the oil industry once again emphasized "shooting the eleplants" and leaving the "mice."

Midway through the Second Plan period, China's exploration effort began to pay greater dividends. Proved reserves doubled, reaching 200 million tons in 1959–60.[15] Crude oil output grew from 2.264 million tons in 1958 (65 percent natural crude) to 5.8 million tons in 1962—fulfilling the goal of 5 million to 6 million tons established for the Second Plan—and the rate of growth (32 percent) exceeded that of the previous period.

This rapid growth of domestic crude oil output reduced dependence on foreign oil. Imports averaged more than 2.8 million tons annually (38 percent of total consumption) during the period; but, after reaching a peak of almost 3.3 million tons in 1960, they began to decline. In 1961, oil imports declined to just over 3 million tons; the following year they fell again, to less than 2 million tons—a downward trend that was to enable the Chinese to boast, in 1963, that they were "basically self-sufficient" in oil.

Behind this decline in imports, and the single most significant development in the history of China's petroleum industry, was the discovery and development of the huge petroleum reserves of the Sung-Liao Basin in Northeast China. The principal Sung-Liao oilfield, Ta-ch'ing (roughly, "great celebration"), began production in 1960, when approximately 400,000 tons of oil were lifted. By 1963, Ta-ch'ing was producing an estimated 2.3 million tons of crude oil—36 percent of PRC output.[16] The discovery of large reserves in Northeast China meant that China had commercially valuable oil resources located reasonably close to the industrial and population centers of the Northeast and East. Transportation costs for the oil industry fell, and prospects for oil exports brightened.[17]

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[15] Yeh, *op. cit.*, p. 29.
[16] For data on Ta-ch'ing see the table in appendix A.
[17] Data on transportation costs during the 1950's are available in Yeh, *op. cit.*, pp. 32–33.

TABLE 2.—CHINA: REGIONAL OIL PRODUCTION IN 1958 AND 1974

[In thousands of metric tons]

Oilfield (Basin)	1958	1974
West and northwest:		
Karamai (Dzungarian)	350	1,036
Yu-men (Chiu-ch'uan)	1,002	710
Yen-ch'ang (North Shensi)	(30)	(120)
Leng-hu (Tsaidam)	30	530
Szechwan (Szechwan)	[1] 10	(200)
East and northeast:		
Ta-ch'ing (Sung-Liao)		19,400
Sheng-li (North China)		11,000
Ta-kang (North China)		3,740
Hupeh		(1,000)
Fu-yu (Sung-Liao)		(2,000)
P'an-shan (North China)		(1,500)
I-tu (North China)		(1,500)
Unknown	[2] 50	[2] 19,564
Synthetic production	792	(3,000)
South China (Mao-ming)		(200)
Northeast		(2,800)
Total production	2,264	65,300

[1] Planned.
[2] Produced at unknown fields and/or remainder due to inaccurate production estimates at known fields.

Note: Parentheses indicate lower degree of certainty.
Source: See app. A.

1963–Present: Self-Sufficiency

In 1963 China produced only 6.4 million tons of crude oil; oil imports supplied 21 percent of the oil consumed. Eleven years later, in 1974, crude oil output had risen to 65 million tons, and China no longer depended on oil imports. Not only was the pace of economic development no longer constrained by inadequate oil supplies, but oil exports had also emerged as a major source of hard currency earnings. Of particular interest to the international oil community was that Peking had begun exploratory drilling to ascertain offshore reserves—reserves which, although largely unconfirmed, were being compared by outsiders to those of the Middle East.

These developments were the most obvious manifestations of a series of oil discoveries made since the early 1960's, of which Ta-ch'ing was only the first.[18] The development of Sheng-li, Ta-kang, P'an-shan, I-tu, Fu-yu, and perhaps other oilfields, shifted the center of the oil industry from the West and Northwest to the East and Northeast (see table 2). Synthetic petroleum, which accounted for 35 percent of crude output in 1958 and was still an important source of oil in 1963, had become quite small in percentage terms—at most, synthetic output was 3 to 3.5 million tons or 5 percent of output in 1974.[19]

This was an entirely new era. The intense search during the 1950's and early 1960's for large new deposits of natural crude oil had paid handsome dividends. China was not oil-poor and the stage was set for its entry onto the international oil scene as an exporter.

[18] For information on the development of and production at China's known oilfields see appendix A.
[19] See the note on synthetic oil production in appendix B.

RESERVES

Proved reserves of natural crude oil at the end of 1957 were approximately 100 million tons [20]—an increase of 70 million tons over the pre-1956 figure. This apparently exceeded the target for the FFYP, which called for an increase of 55 million tons.[21] Despite the over-fulfillment of the Plan target, Ministry officials were displeased with the results of prospecting efforts.[22] Mistakes and waste had raised costs and eroded the impact of the 1 billion yuan invested in prospecting activities in 1953–57.[23] By the end of 1959 an additional 100 million tons were added, to bring proved reserves to 200 million tons.[24]

In 1960 the Chinese cited figures to demonstrate the expansion of prospecting activities in the previous decade: [25]

> In old China there were only 24 trained geologists in this field, eight worn-out drilling rigs, very little surveying equipment and no regular exploration party whatsoever. Today, in contrast, there are 916 oil exploration parties (not including those under the Ministry of Geology) working in 34 different areas of the country. Ninety-four of these are geophysical crews. There are a total of 480 modern drilling rigs, 60 times the preliberation number. Postliberation cumulative drilling footage amounted to 3.37 million meters by the end of 1958, more than 47 times the total for the 42 years before liberation. The drilling footage in 1957, the last year of the FFYP, was 10.5 times that of 1952, while total footage drilled in 1958 was more than three times the 1957 level. Up to the end of 1958, 2,964 exploratory wells were drilled—24 times the total for the 42 years before liberation. The number of exploratory wells drilled in 1957 was 9.4 times that of 1952, and the 1958 figure was 3.8 times that of 1957. Up to the end of 1958, 1,871 producing wells were drilled after liberation—41.5 times the total for the 42 preliberation years.

The Chinese have published no estimates of their crude oil reserves since 1960. Western analysts, particularly in recent years, have made estimates to fill this void. These estimates vary greatly, most of them surfacing in the trade or popular press without any explanation of their derivation. The reader should be cautioned that without firm data from the Chinese, any discussion of oil reserves must be tentative. Statements that China has "vast" reserves, or specific estimates of China's reserves, cannot be taken too seriously; the margin of error is so large, or the concept used is so vague, that the statements are meaningless to any exercise which attaches a great deal of significance to a particular number. At the same time, it may be worthwhile to talk about reasonable minimal figures.

The most authoritative estimates of China's current reserves are those of A. A. Meyerhoff [26] who estimated that, at the beginning of 1969, China's proved plus probable plus potential plus possible reserves of natural crude oil totaled approximately 2.68 billion metric tons.[27] Of this total, he considered proved reserves to be 182 million

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[20] Yeh, *op. cit.*, p. 29.
[21] *First Five-Year Plan*, p. 73.
[22] See the source cited in footnotes 10 and 14.
[23] Of the 1.9 billion yuan invested in capital construction in the petroleum industry during 1953–57, "more than half" was invested in prospecting; see *Chi-hua Ching-chi* (Planned Economy), No. 12, 1957, pp. 12–15.
[24] Yeh, *op. cit.*, p. 29.
[25] *Peking Review*, Jan. 12, 1960, p. 12.
[26] A. A. Meyerhoff, "Developments in Mainland China, 1949–68." *The American Association of Petroleum Geologists Bulletin*, v. 54, No. 8, 1970, pp. 1567–1580.
[27] *Ibid.*; see erratum sheet for table 4, p. 1573. Jan-Olaf Willums has noted that Iraqi geologists, who were invited to China to study hydrocarbon reserves, released information in 1971 which seems to support Meyerhoff's estimates; Jan-Olaf Willums, "Prospects for Offshore Oil and Gas Developments in the People's Republic of China", a paper prepared for the Offshore Technology Conference, 1974, p. 542.

tons and probable reserves to be 777 million tons, for a total of 959 million tons of proved plus probable reserves.[28]

Reserves have grown—perhaps considerably—since Meyerhoff's estimates were made. The decision to develop oil exports into a major source of export earnings during the fourth and fifth 5-year plans (1971–80) implies that additions to reserves have been large during recent years. For 1974, for example, NCNA reported: [29]

> In prospecting, the oil-bearing area located in the past year was bigger than in any previous year. Oil resources were found in new localities where a number of oil wells were drilled and proved high-yielding. Marine oil prospecting made further progress. Increases in oil reserves and estimated resources laid the material foundation for continuous high-speed development of China's petroleum industry.

The proved reserves-output ratio implicit in Meyerhoff's estimates—dated January 1, 1969—can be used to infer an estimate of current proved and proved plus probable reserves. Meyerhoff has characterized his estimates as conservative; [30] the estimates derived here should also be considered conservative.

Implicit in Meyerhoff's figures for proved reserves and output is an 18-year depletion period—i.e., if output continued at the 1968 rate, proved reserves would be depleted in 18 years. Applying this ratio to output data for 1974, when approximately 62 million tons of natural crude oil were produced, we can derive a proved reserves figure of 1.116 billion tons for 1974. If this new figure for proved reserves is simply added to Meyerhoff's 1969 figure for probable reserves, the new figure for proved plus probable reserves is 1.893 billion tons. However, this allows for no increase in probable reserves. If it is assumed that probable reserves were 4.3 times proved reserves in 1974—as in Meyerhoff's estimates for 1969—then proved plus probable reserves would amount to approximately 5.9 billion tons in 1974. Changes in proved plus probable reserves alone would raise Meyerhoff's estimate of total reserves by 4.9 billion tons to approximately 7.6 billion tons in 1974.[31]

As one measure of the conservative nature of this estimate, reserves can be inferred from "planned" output for 1980: If output continues to grow at approximately 20 percent annually, 1975–80, by 1980 China's crude oil production would be approximately 200 million tons per year (4 million barrels per day). From this, using a very short 10-year depletion period, "proved" reserves of 2 billion tons can be inferred, or 0.88 billion tons greater than derived above. A more reasonable 15-year depletion period would imply "proved" reserves of 3 billion tons—almost three times the reserves figure derived above.

The above figures pertain only to onshore reserves of natural crude oil.[32] Much less is known about China's offshore reserves. However, preliminary geophysical data gathered in the late 1960's—data not yet confirmed by exploratory drilling—are the source of great optimism

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[28] Meyerhoff's estimate of proved reserves in 1969 thus is slightly lower than the proved reserves figure announced by the Chinese in the late 1950's.

[29] Foreign Broadcast Information Service, *Daily Report: People's Republic of China*, Jan. 3, 1975, E–10 (hereafter cited as FBIS).

[30] Meyerhoff, *op. cit.*, p. 1577.

[31] These estimates are so rough that cumulative production since 1968 (248 million tons, 1969–74) can be ignored.

[32] Proved reserves recoverable from oil shale have been estimated at 700 million metric tons; Meyerhoff, *op. cit.* p. 1573, fn. Earlier estimates of shale oil reserves can be found in those sources cited in fn. 1.

about China's potential as an oil producer and exporter. Wageman, et al., in a statement summarizing the findings of the first major scientific survey of the Chinese continental shelf, concluded that "The continental shelf between Taiwan and Japan may be one of the most prolific oil reservoirs in the world." [33] And a preliminary survey conducted in 1969 reportedly convinced the Japanese Government that "well over 15 billion metric tons of quality oil were trapped beneath the Senkaku area." [34] Quantitative statements based on geophysical data alone cannot be taken seriously. But the results of preliminary surveys apparently justify at least a guarded optimism that China has sizable offshore oil resources.

The Chinese themselves have talked very little about the oil potential of their offshore areas. An article on worldwide offshore reserves in the journal *K'o-hsueh shih-yen*, (Scientific Experiment) discussed China's potential only in the broadest terms: [35]

> The long coast of China stretches more than 14,000 kilometers from the Yalu River in the north to the Peichang River in the south, not including the numerous islands along the coast. The continental shelf of our country is a little over 1/20th of the world's, with shores lying off the Pohai, Yellow, East China, and South China Seas. It is therefore not difficult to imagine that these immense continental shelves contain rich offshore oil reserves.

And,

> The offshore sedimentary basins lying on the continental shelves between the T'iao-yu (Senkaku) Islands at the farther end of the East China Sea and the coast of the China mainland are considered to be most favorable to oil prospecting and exploitation. Without any doubt, this could lead to the discovery of a significant number of oil and gas fields in the future.

Other reports reflect partial confirmation—presumably by exploratory drilling—of these probabilistic statements: [36]

> Initial exploration shows that the continental shelf in China's seas has rich oil deposits and this opens up new vistas for exploitation.

Whatever China's current reserves,[37] they should grow rapidly. Continued exploration of the fields discovered in the 1960's can be expected to lead to a revision upwards of the estimates for those fields. Discovery of other onshore fields will further add to reserves. And the expansion of offshore exploration, as Chinese capabilities in that area grow, should result in even larger additions to reserves. The ECAFE study, industry expectations, and Chinese statements all point in this direction.

Current Exploration

Current exploration activity is widespread. The bulk is concentrated on delineating and expanding existing fields in the East and Northeast. The remainder is allocated among the older fields of the West and Northwest, the new field near Canton, and the offshore areas of the Pohai Gulf, the Yellow Sea, and the South China Sea. The following

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[33] John M. Wageman, Thomas W. C. Hilde and K. O. Emery, "Structural Framework of East China Sea and Yellow Sea," *The American Association of Petroleum Geologists Bulletin*, Vol. 54, No. 9, 1970, p. 1641.

[34] Willums, *op. cit.* p. 542.

[35] No. 4, 1973.

[36] FBIS, Sept. 20, 1974, E–5.

[37] Professor Ping-ti Ho of the University of Chicago has reported that "authoritative sources in Peking" confirmed to him that "the size of China's known oil deposits, not counting the unexplored and potentially rich areas of the Yellow Sea and East China Sea, are larger than presently known reserves of the entire Middle East"; *Los Angeles Times*, Oct. 13, 1974, part VI, p. 1.

discussion focuses primarily on China's offshore capabilities and ongoing offshore exploration.

Peking's comments about oil prospecting generally are vague and are hidden away in reports on prospecting for mineral resources in general. For example, in September 1973, NCNA reported that regional geological surveys carried out in the 7 years since 1966 covered an area two and a half times that of the previous 10 years. Exploratory work was 4.8 times that done in 1965. Comparing 1972 with 1965, known deposits of iron ore had increased by 50 percent, coal by 58 percent, and copper by 65 percent; "new progress had also been made" in prospecting for petroleum.[38] Another announcement, in 1974, noted that, "An important 1974 achievement * * * is the use of a floating drilling rig for sea exploration." [39]

The Chinese probably began offshore exploration in the early 1970's, working from fixed platforms in the shallow Pohai Gulf. In September 1972, Japan Drilling Co. announced the sale of a second-hand offshore rig, the "Fuji," to the Chinese; the rig was to be delivered in March 1973. The "Fuji," purchased for a reported $8.4 million, is a jack-up with four legs, 52 meters in length. It was built at the Hiroshima shipyard of Mitsubishi Heavy Industries in 1969 and in 1972 was working off Indonesia.[40] According to Japan Drilling's Executive Director Toru Yoshizaki, who spent 2 weeks in Peking in early 1972 negotiating the sale of the "Fuji," China was already working the Pohai Gulf with two jack-up rigs and a semisubmersible.[41] Yoshizaki described one of the jack-ups as medium-sized, capable of working at a depth of 20–25 meters and with a drilling capability of 2,000–2,500 meters.[42]

Since the purchase of the "Fuji"—renamed the "Pohai No. 2" by the Chinese—other negotiations for offshore rigs have been reported. Discussions with Far East Levingston Shipbuilding in Singapore in the summer of 1974 fell through after disagreements over "dollars and cents."[43]

And there have been reports of ongoing discussions with Mitsubishi for additional jack-ups and for a semisubmersible.[44] In the way of support equipment, Peking has talked to Japanese firms about underwater pipelines and has reportedly placed orders with Japanese firms for five supply boats, two ADS–IV diving systems, a 500-ton survey vessel, and seismic equipment for offshore use. [45] A 400-ton supply ship was purchased from Japan Drilling Co. in 1972, and in 1973 eight more supply ships were purchased from Weco Shipping Co., a Danish firm.

Aside from the "Pohai No. 2," the only other rigs at Peking's disposal have been produced in domestic shipyards. One of these, the "Pohai No. 1," was recently reported to be a jack-up with four legs, 70 meters in length. It is China's first domestically-produced jack-up,

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[38] FBIS, Oct. 15, 1973, B–2.
[39] FBIS, Dec. 26, 1974, E–2.
[40] FBIS, *Daily Report: Asia and Pacific*, Sept. 12, 1972, C–3 (hereafter cited as FBIS, *Asia*).
[41] *Ocean Oil Weekly Report*, July 17, 1972.
[42] *The Asian Magazine*, July 30–Aug. 5, 1972, supplement to *Hong Kong Standard*, July 31, 1972.
[43] *Hong Kong Standard*, July 10, 1974.
[44] *Asahi Shimbun*, June 22, 1973.
[45] FBIS, *Asia*, Feb. 12, 1974, C–2.

and for the past 2 years has been working in the Pohai.[46] Another, a catamaran drillship, has been reported working off Shanghai in the southern Yellow Sea. With these rigs and the "Pohai No. 2," extensive exploration has been carried out in the Pohai Gulf. By now the Chinese must have a good idea of the size of the reserves in the gulf, and a nominal quantity of oil probably is being produced from Pohai wells.

Late in 1974 the Chinese announced that they had begun drilling in the Yellow Sea, near Shanghai: [47]

> The first Chinese-designed and built floating drilling vessel for sea exploration, Kantan No. 1, has successfully drilled a well in the southern part of the Yellow Sea for deep water oil prospecting. The trial operation has provided China with initial experience in marine geological prospecting * * * China has done some work in this field in recent years, but the drilling equipment used to be a fixed platform resting on piles or legs, and operated in near and shallow seas instead of deep seas.

The vessel, the catamaran drillship mentioned above, was built by the Shanghai Hutung Shipyard by piecing together and reshaping the hulls of two cargo ships. Other prospecting activity has been reported in the Shanghai area,[48] but this was the first mention of a drillship and was perhaps the first drilling activity in Shanghai's offshore waters.

Other prospecting activity has been reported in the South China Sea, particularly around Hainan Island.[49] The structures of interest may be extensions of the structures recently drilled near Canton. However, with one exception no drilling has been reported in the South China Sea area. Canton television in early 1974, publicizing China's claims to the Paracel Islands, broadcast a film which showed an apparent drilling rig located on Yung-hsing Island.[50] No other information is available.

From the above, Peking clearly is moving to exploit its offshore oil. The rate of exploitation remains unclear. Substantial production from the Pohai area could begin soon, once collecting systems and pipeline facilities are installed. Following the Pohai, Peking most likely will develop the South China Sea area around Hainan Island—if further exploration confirms commercial oil deposits. Aside from the drilling around Shanghai—which appears to be merely a training exercise at the moment—China has shown no signs of moving into the East China and Yellow Seas, although they are aware of the oil potential of the East China Sea near the Senkaku Islands.

Petroleum Imports

As noted earlier, since the mid-1960's petroleum imports have remained a small percentage of the oil consumed in China, fluctuating between 2 and 3 percent during 1965–70 and remaining around 1 percent thereafter.[51]

Along with the reduction of petroleum imports came a change in the pattern of trade. Over 95 percent of China's petroleum imports in the 1950's came from the Soviet Union and Eastern Europe, with

[46] *K'o-hsueh shih-yen*, No. 1, 1975.
[47] FBIS, Dec. 31, 1974, E–1.
[48] FBIS, Nov. 29, 1974, G–2.
[49] *Daily Telegraph*, London, Sept. 20, 1974.
[50] FBIS, June 7, 1974, H–2.
[51] For additional import data and citations, see appendix B, table 1.

the U.S.S.R. supplying the overwhelming portion. Since the early 1960's, imports from Albania and Romania have grown slightly; imports from the U.S.S.R. peaked in 1960 and essentially ended in 1965. Following the closing of the Suez Canal in 1967, which interrupted Albanian and Romanian shipments, China began to import crude and products from the Middle East. Egypt began exports to China in 1968 with the delivery of 120,000 tons of products and in 1970 exported over 400,000 tons of crude oil to China. Egyptian exports to China apparently came to an end in 1971 when just under 100,000 tons of crude oil were shipped. No further imports from the Middle East were observed until 1974 when China resumed imports of an undetermined quantity of oil from the Middle East.

In the 1950's and early 1960's, petroleum imports were integral to China's economy. Today, imports of crude and petroleum products serve two functions: (1) they reduce the amount of petroleum that must be shipped from the North and East to oil-deficient South China, and (2) they apparently serve to offset China's trade surpluses with the exporting countries and/or are tied to trade agreements with those countries.

Petroleum Exports

Chinese officials first began to talk openly of oil exports in early 1964. Chao An-po, secretary of the Sino-Japanese Friendship Association, indicated to Japanese businessmen in February 1964 that China was prepared to export oil to Japan, beginning in 1965.[52] Reportedly, Chao said that "hundreds of thousands of tons" of crude oil would be available for export in 1964, and "several million tons" would be available in 1965. Until 1973, Chao's "offer" was an anomaly. The interruptions of the Cultural Revolution and unanticipated increases in the domestic petroleum requirements may help explain why China did not follow through on the offer. Perhaps of more importance was that the coolness prevailing in Sino-Japanese relations through the late 1960's was not disspelled until 1973.

Crude oil exports began in 1973, when a contract was concluded with International Oil Co., a Japanese firm expressly established to handle oil imports from China. One million tons of crude oil, at $3.75 a barrel (FOB) was exported to Japan in 1973.[53]

In 1974, crude oil exports to Japan rose to 4 million tons and were handled by International Oil Co. and a second group, the Japan-China Oil Import Council. However, exports were below the 4.9 million tons that the Chinese hoped to sell to Japan. Under the pressure of a mounting trade deficit in the second half of the year, China pressed the importing firms to take still larger quantities of crude.[54] By late summer, the two groups had separately agreed to import a total of 4.5 million tons and had promised to try to take an additional 400,000 tons only after the Chinese had lowered their asking price from $14.80 a barrel in the first half of the year, to $12.85 a barrel in

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[52] British Broadcasting Corporation, *Summary of World Broadcasts, Far East,* W251, Feb. 19, 1964, B–26 (hereafter cited as SWB).

[53] Tokyo, Kyodo News Service, Nov. 15, 1973. *Japan Chemical Week,* Mar. 21, 1974, p. 2, cites a price of $3.94 a barrel, FOB. Reportedly, the Chinese initially agreed to only 200,000 tons, citing limitations imposed by transportation and handling facilities; see *Asahi Evening News,* Tokyo, Apr. 24, 1973.

[54] See *Yomiuri Shimbun,* Tokyo, Nov. 29, 1974.

the third quarter, to $12.80 in the final quarter. Faced with a shrinking demand for oil and with shifting exchange rates which made the already expensive Chinese oil even more expensive,[55] the Japanese firms eventually declined delivery of 900,000 tons of Chinese oil, limiting imports from China in 1974 to 4 million tons.[56]

Earlier, to offset the possibility that exports to Japan might not reach the desired 4.9 million tons, and in an attempt to cope with the growing trade deficit, China had begun to seek out new customers. Hurriedly, Peking agreed to export 250,000 tons of crude oil to the Philippines in the fourth quarter;[57] and both Australia and New Zealand were sounded out as potential customers for Chinese oil.[58]

By yearend, in addition to the 4 million tons of crude oil exported to Japan, China had sold 250,000 tons of crude oil to the Philippines, 200,000 tons of products to Hong Kong,[59] and 50,000 tons of diesel fuel to Thailand.[60] Another 1 to 1.5 million tons had been shipped to North Vietnam and North Korea, presumably under aid agreements. Altogether, petroleum exports to non-Communist countries totaled at least 4.5 million tons and earned approximately $450 million.[61] Still, China's inability to export more than 4 million tons to Japan resulted in a record deficit with that country. This deficit, coupled with the extreme softening in 1974 in China's markets for its traditional export items made the expansion of oil exports to higher levels in 1975 an urgent task.

Exports in 1975

At preliminary discussions between the two import groups and a visiting Chinese oil trade mission to Japan in October 1974, a minimum of 8 million tons of crude oil exports to Japan was tentatively agreed on for 1975.[62] This figure was confirmed in February 1975,[63] and later that month, International Oil Trading Co. contracted to import 5.4 million tons of crude oil in 1975, at a reduced price of $12.10 a barrel.[64] Although the new price is still higher than the price for Middle Eastern crude, it is 70 cents a barrel lower than the $12.80 set for Chinese crude during fourth quarter 1974 and 50 cents lower than Indonesian crude. This concession by the Chinese, and the agreement to settle in dollars, met the Japanese complaints that had been voiced in late 1974 and made Chinese crude more competitive in the Japanese market. Peking also agreed to a lower price for the 900,000 tons of exports carried over from 1974.[65]

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55 *Ibid.*; see also SWB, W807, Jan. 1, 1975, A–20.

56 *Ibid.* Of the 4 million tons total, International Oil Co. imported 3 million tons, with the remaining 1 million tons imported by Japan-China Oil Import Council. International Oil was scheduled to take 3.3 million tons; Japan-China Oil Import Council was to take 1.6 million tons. *Ibid.*

57 FBIS, *Asia*, Oct. 15, 1974, P–2.

58 FBIS, Oct. 15, 1974, A–18 and FBIS, *Asia*, Oct. 15, 1974, M–2; London *Times*, Nov. 18, 1974.

59 Projected on basis of January–September data reported in *Hong Kong Trade Statistics*, September 1974, pp. 25–26.

60 FBIS, *Asia*, Jan. 15, 1974, J–2. Thailand hoped to obtain 125,000 tons in 1974, but only 50,000 tons were obtained. Negotiations for an additional 75,000 tons were suspended, pending repeal of Revolutionary Party Decree 53, which prohibited trade with China; FBIS, *Asia*, July 25, 1974, J–2. The ban was lifted on Dec. 6, 1974; *Ibid*, Dec. 6, 1974, J–1.

61 Sales to Japan earned approximately $410 million; to Thailand, $2.2 million; to Hong Kong, $17.3 million; to the Philippines, $18.3 million.

62 *Yomiuri Shimbun*, Tokyo, Oct. 22, 1974.

63 *Asahi Shimbun*, Tokyo, Feb. 1, 1975.

64 FBIS, Feb. 19, 1975, A–7.

65 FBIS, Feb. 27, 1975, A–17.

The Japan-China Oil Import Council, the other group engaged in the import of Chinese oil, is also expected to sign a contract shortly. Presumably, they will contract for 2.6 million tons for 1975, also at $12.10 a barrel. Sales to both groups will earn the Chinese more than $700 million in 1975.

Additional scheduled exports to the Philippines (750,000 tons of crude oil),[66] to Thailand (perhaps 150,000 tons of diesel fuel),[67] and to Hong Kong (perhaps 300,000 tons of petroleum products) should earn China an additional $95 million in 1975[68] to bring total projected earnings from petroleum exports in 1975 to at least $800 million, compared with approximately $450 million in 1974.

Consumption of Petroleum

Petroleum consumption has grown from 3.3 million tons in 1957 to approximately 60 million tons in 1974[69]—an average annual rate of increase of 18.6 percent. Oil now provides China with approximately 17 percent of its primary energy and has been particularly important in the modernization of the agricultural sector.

Oil in an Energy Context

In 1957, the People's Republic relied on coal for almost 95 percent of its primary energy; hydroelectric power for 2.5 percent; oil for 1.9 percent; and natural gas for 1 percent (see table 3).[70] The pattern of primary energy production in 1974 was considerably different. The share of primary energy provided by coal had fallen to 63 percent; the share provided by hydroelectric power remained at 2.5 percent. Both oil and natural gas grew in relative importance, each providing approximately 18 percent of the primary energy produced in 1974.

TABLE 3.—CHINA: PRIMARY ENERGY PRODUCTION, SELECTED YEARS[1]

Year	Total (million metric tons of coal equivalents)	Share (percent) Coal	Petroleum	Natural gas[2]	Hydroelectric
1957	102.25	94.57	1.86	1.04	2.53
1965	206.20	79.02	6.81	11.76	2.40
1970	326.82	70.19	11.34	16.12	2.36
1974	458.63	62.75	17.01	17.72	2.52

[1] The following coefficients were used to convert the sources of primary energy into coal equivalents: coal (metric tons), 0.8 for coal from large mines (70 percent of total coal output) and 0.6 for coal from small mines; crude oil (metric tons), 1.3; natural gas (1,000 cubic meters), 1.33; and hydroelectricity (1,000 kilowatt-hours), 0.55.

[2] The share of primary energy provided by natural gas shown above is based on the estimates of natural gas output shown in app. B, table 2. Those estimates are much higher than any previous estimates. For further comments, see app. B, table. 2

Since 1970, growth in coal production has faltered. In 1971, growth was 8.1 percent, and had fallen to 2.9 percent by 1974.[71] The

[66] FBIS, *Asia*, Oct. 15, 1974, P–2.

[67] FBIS, *Asia*, Jan. 9, 1975, J–3. A contract for 75,000 tons of diesel oil was signed on Jan. 24, 1975; FBIS, *Asia*, Jan. 27, 1975, J–6.

[68] This assumes prices of $10 per barrel for crude oil sold to the Philippines and $12 per barrel for the products sold to Thailand and Hong Kong.

[69] Consumption is defined as crude oil production plus net petroleum imports.

[70] See the footnote to the natural gas share in table 3.

[71] Coal production was 310 million metric tons in 1970; 335 in 1971; 357 in 1972; 378 in 1973; and 389 in 1974.

average rate of growth for the entire period, 1970–74, was only 5.9 percent, substantially below the rate of growth of industrial production. As a consequence a growing number of industrial facilities have been converted from coal-burning to oil-burning, a development which is evident in the growth of the share of primary energy provided by petroleum between 1970 and 1974. From 11 percent in 1970, petroleum's share jumped to 17 percent in 1974.

Pattern of Petroleum Consumption

Petroleum consumption has grown at a rate of 18.6 percent since 1957. At that time, transportation and industry each consumed roughly 40 percent of petroleum supplies. The remainder was consumed by the agricultural [72] (9 percent) and household sectors (6 percent), and by the military.

Today, transportation and industry still consume a large share of petroleum supplies. However, since the early 1960's when Peking decided to increase investment in the agricultural sector, the share of petroleum consumed by agriculture has steadily risen. This can be inferred from data shown in table 4.

TABLE 4.—INDICATORS OF PETROLEUM CONSUMPTION

	Transportation [1]	Tractor inventory [2]	Irrigation pumps inventory [3]	Industrial production [4]
1957	172.9	24.6	0.23	100.0
1973	525.0	485.0	15	416.0
Average annual growth (percent)	7.2	20.5	30	9.3

[1] Billion ton-kilometers.
[2] Thousands of standard units.
[3] Nonelectric, million horsepower.
[4] Index.

The inventories of tractors and oil-powered irrigation and drainage equipment in agriculture have grown by 20.5 percent and 30 percent annually, since 1957.[73] Transportation and industrial output have grown much more slowly—by 7.2 percent and 9.3 percent annually.

Thus it is clear that the share of petroleum consumed by agriculture has risen considerably since the late 1950's. Today, agriculture's share can be calculated at 15–20 percent.[74] This calculation is only an approximation and is used only to illustrate the impact of China's agriculture-first policy on the pattern of petroleum consumption.

Petroleum consumption will continue to grow at a rate similar to the 20-percent rate for 1971–74. The share consumed by industry—a share which has increased appreciably since 1970—will continue to grow, as powerplants and industrial furnaces are converted from coal to oil-burning. The nascent petrochemical industry, once several new imported facilities are added, will also contribute to industry's demand for petroleum.

[72] See the note on petroleum consumption in appendix B.
[73] The 1973 figures for transportation and tractor inventory are very crude estimates made by the author.
[74] See the note on petroleum consumption in appendix B.

NATURAL GAS PRODUCTION

China produced approximately 60 billion cubic meters (bcm) of natural gas in 1974.[75] Of this, 52 bcm was produced in Szechwan Province, traditionally the largest producer of natural gas. The bulk of the remainder probably is oil-associated gas, produced at the major oilfields. These figures indicate that China (and Szechwan alone) is the world's fifth largest producer of natural gas, behind the United States, the U.S.S.R., Canada, and the Netherlands.[76]

From 0.6 bcm in 1957, natural gas production in Szechwan grew to 10.2 bcm in 1962.[77] This phenomenal growth presumably reflected the discovery of large deposits of natural gas during the late 1950's and early 1960's. Interest in gas development was high because Szechwan lacked both coal and petroleum resources to fuel the province's growing industry and to provide for the needs of its more than 75 million people. Growth after 1962 tailed off, but still proceeded at a rate between 15 and 20 percent annually until recently. The province now has more 1,000 kilometers of natural gas pipeline.[78] Two-thirds of its iron and steel plants use natural gas as a fuel, and more than 70 percent of its nitrogen fertilizer is made from natural gas.[79]

Most of the natural gas produced outside Szechwan is oil-associated gas. In recent years, the emphasis placed on petroleum production and the growing need for new energy supplies, has led to tremendous growth in the production of oil-associated gas. The data for 1973 and 1974 imply that natural gas production outside Szechwan grew by almost 130 percent in 1974; oil-associated gas probably accounted for almost all of this increase. Most likely, the bulk of this gas is produced at the Ta-kang, P'an-shan, and perhaps Sheng-li oilfields and is piped to Peking, Tientsin, Shen-yang, Liao-yang, Tsi-nan, and Tsingtao.[80] Nearby oilfields—Yu-men, Karamai, and Fu-yu respectively—may supply gas to the cities of Lan-chou, Urumchi, and Kirin.

The same growing need for energy that has led Peking to capture oil-associated gas instead of flaring it has also led to increased prospecting for natural gas reserves. In mid-1971 Chekiang Province reported that after a year of work, natural gas had been located and nearly 2,000 wells had been sunk in 27 cities and counties throughout the province.[81]

Aside from natural gas, the Chinese also use gaseous byproducts of the petrochemical and metallurgical industries for fuel. NCNA reported in 1974 that 31 cities now have gas service, compared to 16 in 1965, and that the amount of gas supplied to these cities in 1974 was 2.5 times the amount supplied in 1965. However, included in this gas were "oilfield gases, pure natural gas, liquefied petroleum gas, firedamp, coke oven gas, and combustible gas discharged by chemical

[75] The output figure used here—60 billion cubic meters—is much higher than previous estimates of China's natural gas production (for the mid-1960's) would imply, when taken in conjunction with recent statements by the Chinese. See table 2 in appendix B—and especially the notes to that table.

[76] The figures for those countries—all for 1973—are: United States, 648.5 bcm; U.S.S.R., 236.3 bcm; Canada, 88.8 bcm; and the Netherlands, 70.8 bcm.

[77] For sources, see table 2 in appendix B.

[78] FBIS, Sept. 14, 1973, E-1.

[79] FBIS, Jan. 16, 1975, J-1.

[80] For the list of cities using gas, see FBIS, May 17, 1974, E-1.

[81] FBIS, July 21, 1971, C-15.

fertilizer plants."[82] The city of Nanking supplies 300,000 cubic meters of coke oven gas daily to city residents. And coke oven gas is used by heavy industry in the cities of Shanghai and Anshan. These developments have been spurred by coal shortages in recent years, but also behind them is a strong Maoist ethnic to "waste not".

Refining

China's first modern petroleum refinery, constructed during 1956–59 at Lan-chou with equipment and expertise supplied by the U.S.S.R., accounted for a large share of investment in refining facilities prior to 1960.[83] Most of the remaining investment in refining went for the reconstruction of the shale oil facilities at Fu-shun East and for the rehabilitation or expansion of other synthetic and refining facilities.[84] Two small new refineries, believed to have used equipment cannibalized from former Japanese plants, were constructed at the new oilfields in the Tsaidam Basin and Szechwan Province.

By 1960, the Chinese, with Soviet and East European assistance, had expanded the extremely limited refining installations taken over in 1949 into a rudimentary refining industry. The level of technology was roughly comparable to that of the United States in the 1930's. The basic processes were mainly atmospheric and vacuum distillation and thermal cracking. Other processes included coking units, facilities for the production of lubricating oils, and asphalt plants. The most advanced units available were a light ends and polymerization plant at Fu-shun and a thermofor catalytic cracking unit at Lan-chou. With these facilities the Chinese could produce most basic fuels, a limited range of lubricating oils and greases, petroleum coke, and asphalt. The range of products increased from about 10 ordinary products in the early years to approximately 90 varieties in 1960.[85] China remained dependent upon imports for certain high-quality products, including aircraft fuels and lubricants, and for some components and additives.

In spite of the limited investment in the refining industry prior to 1960—probably no more than 30 percent of the 1.9 billion yuan invested in the petroleum industry as a whole—considerable effort was directed to research and training. During the 1950's, Chinese scientific journals published numerous papers on petroleum refining, covering such subjects as petrochemicals, catalyst manufacture, catalytic cracking, polymerization, hydrogenation of shale oil, and production of lubricating oils and additives. Pilot plants were set up for some advanced processes, and design work was undertaken for still others.

Early in the 1960's, after the development of the Ta-ch'ing oilfield, the Chinese began to modernize their refining industry. Soviet assistance was no longer available, following the withdrawal of Soviet technicians in mid-1960. East European countries were potential sources of assistance, but their dependence on the Soviet Union, both politically and technologically, limited any help they could give China. As a result, Peking turned elsewhere for refining technology and equipment.

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[82] FBIS, May 17, 1974, E–1.
[83] *Survey of China Mainland Press*, No. 2137, p. 24 (hereafter cited as SCMP).
[84] The refining plant inherited by the Chinese Communists in 1949 had a throughput capacity of only "several tens of thousands metric tons"; *Chung-kuo hsin-wen*, Canton, Mar. 27, 1964, p. 3.
[85] *Ibid.*

Negotiations with European firms for refining equipment and technology began as early as 1961. Eventually two major purchases were concluded. In December 1963 a contract was signed with the Italian firm Snam-Projetti.[86] In 1965 a second contract was concluded with the West German firm Lurgi Gesellschaft.[87] The facilities constructed by Lurgi reportedly included a cracking unit and an olefins extraction unit.

At the same time, the Chinese were also negotiating with Japanese firms. Several Japanese technical delegations visited China between 1963 and 1966, and at least one Chinese technical delegation visited Japan, in 1964.

Assistance obtained from Cuba during the early 1960's probably had the greatest impact on the development of China's refining industry in the late 1960's and early 1970's. The Nico Lopez refinery in Havana—the former Esso and Shell refineries—contained two units of special interest to the Chinese: a fluid catalytic cracking unit and a "platformer." The Chinese apparently were given access to technical data on the facilities and probably obtained some assistance from Cuban engineers.[88] Subsequently catalytic cracking units and platformers began to appear throughout China.[89]

Prior to 1965 most new construction was limited to distillation and thermal cracking units patterned after the facilities at Lan-chou. Construction of two delayed coking units represented the only addition of a new process. After 1965 the pace of construction increased markedly. A number of catalytic cracking units were added, and two showpiece refineries, both constructed without outside assistance, were added—the Ta-ch'ing refinery, essentially completed in 1966, and the Peking General Petrochemical Plant, which began operation in 1969.[90]

Peking has never given an absolute figure for total refining capacity, but the sketchy evidence available indicates that it was at most 44 million metric tons in 1973 and 47 million tons in 1974 [91]—40 million tons of which are accounted for by the refineries listed in appendix B, table 3. More than half of the increase in refining capacity in 1965–73 was achieved through "technical transformation" of existing refineries—with an investment equivalent to only 40 percent of spending on new plant.[92]

The refining industry today is comparable to United States or other Western refining industries of the late 1950's. Existing facilities can produce a complete range of products and a variety of feedstocks for the petrochemical industry. The number of different products available today is more than 160,[93] compared with 90 varieties in 1960. The most notable change since 1960 has been the growth in catalytic cracking and reforming, and in delayed coking. By the end of 1973 the majority of China's oil refineries were equipped with catalytic cracking, platforming, and delayed coking units; only a few refineries had these units in 1965.[94]

[86] *Far Eastern Economic Review*, Jan. 23, 1964, p. 156.
[87] *Ibid.*, Nov. 5, 1964, p. 286 and *Frankfurter Rundschau*, Nov. 30, 1965, p. 10.
[88] *China Trade and Economic Newsletter*, No. 120, October 1965, p. 4.
[89] SCMP, No. 3690, p. 21 and *The Oil and Gas Journal*, Jan. 23, 1967, p. 62.
[90] *Peking Review*, No. 15, Apr. 14, 1972, p. 4.
[91] See the note on refining capacity in appendix B.
[92] New China News Agency, Peking, Sept. 22, 1974 (hereafter cited as NCNA).
[93] FBIS, Sept. 5, 1973, B-11.
[94] NCNA, Peking, Sept. 22, 1974.

TRANSPORTATION

Until the early 1970's, China transported its petroleum almost entirely by truck, rail, and small tanker (5,000–10,000 DWT). The only pipelines were those connecting oilfields with refineries—Karamai to Tu-shan-tzu (147 kilometers) and Yu-men to Lan-chou (roughly 700 kilometers).[95] By the late 1960's oil and oil products had become a particularly heavy burden for the unsophisticated transportation system.[96] Over the past 4 years, China has set about remedying this situation through the construction of pipelines, the modernization of port facilities, and the construction and purchase of larger tankers.

Construction of a 1,152-kilometer-long "wide-bore" pipeline (presumably at least 24 inches in diameter) connecting Ta-ch'ing oilfield near An-ta, Heilungkiang Province with the port of Ch'in-huang-tao on the Pohai Gulf began in the fall of 1970.[97] The pipeline, with 19 pumping stations, was completed by October 1973 and began operation shortly thereafter. Construction of a second pipeline, paralleling the northernmost segment of the first and terminating at T'ieh-ling in Liaoning Province began in September 1973 and was completed by October 1974. Presumably this line will be extended to the port of Dairen.[98] A third "long-distance" pipeline connecting Sheng-li oilfield with the port of Huang-tao, near Tsingtao, was also completed in late 1974.[99] Twenty-four-inch pipelines can handle as much as 12 million tons of oil yearly. Thus the above pipelines, particularly the two from Ta-ch'ing, will appreciably reduce the amount of oil carried by China's railroads.

Investment at China's nine major ports in 1973 was more than double that of 1972, and in the first half of 1974 was three times as much as in the first half of 1973.[100] A central feature of the investment program has been facilities for loading and unloading oil. Dairen's oil-handling facilities have been enlarged, and in December 1974 it was announced that when a heated oil tank then under construction was put into operation, oil-handling capacity would increase by over 30 percent.[101] A newly constructed oil loading terminal at Ch'in-huang-tao, the terminus of the pipeline for Ta-ch'ing, began initial operation in October 1973.[102] Finally, handling facilities have also been installed at Huang-tao, the terminus of the pipeline from Sheng-li, and at Ch'an-chiang, in South China, the first Chinese port capable of handling 50,000 DWT tankers.[103] These ports are also being dredged to accommodate larger ships; and berthing facilities for larger ships and tankers are being constructed. The Chinese have also shown an interest in mooring buoys, which would eliminate some costly dredging in the shallow Pohai.

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[95] The Yu-men to Lan-chou pipeline, whose existence has been questioned, is referred to in Y. I. Berezina, *op. cit.*, p. 50. When Peking recently announced the 1,152-kilometer pipeline from Ta-ch'ing to Ch'in-huang-tao, however, it referred to the new pipeline as China's "first long-distance" pipeline; see *The Journal of Commerce*, Dec. 31, 1974, p. 1.

[96] In 1974, the heavy volume of oil carried by the rail line between Ta-ch'ing and Dairen had apparently lengthened the turn-around time for ships at Dairen; see Audrey Donnithorne, "Recent Economic Developments," *China Quarterly*, No. 60, December 1974, p. 773.

[97] FBIS, Dec. 30, 1974, E–1.

[98] This is suggested by reports that China plans a pipeline from Ta-ch'ing to Dairen; *Modern Asia*, October 1973, p. 13; FBIS, Dec. 11, 1973, B–1.

[99] FBIS, Jan. 8, 1975, G–4.

[100] FBIS, Dec. 19, 1973, B–13; NCNA, Peking, Aug. 10, 1974.

[101] FBIS, Dec. 27, 1974, L–2.

[102] FBIS, Oct. 23, 1973, F–2; FBIS, Jan. 31, 1975, K–1.

[103] FBIS, Sept. 12, 1974, H–6.

To complement investment in port facilities, Peking has also begun to construct and purchase larger ships and tankers. In the summer of 1974, Dairen's Hung-ch'i shipyard publicized the completion of a 24,000 DWT tanker, christened the "Ta-ch'ing No. 61".[104] The largest tanker previously built by the Chinese was the 15,000 DWT "Ta-ch'ing No. 27", also constructed at Hung-ch'i shipyard. At least one large tanker was added to China's international (versus coastal) fleet during 1974. The "Beauregard", a 75,000 DWT tanker, was purchased from a Norwegian firm at midyear.[105]

Port facilities and the average size of China's tanker fleet will become more important considerations as crude oil exports expand. When ports are able to accommodate larger tankers, transport costs will fall and PRC crude will become more competitive in the international market.

Prospects

Output and Exports

Both governments and international oil companies, seeking new sources of non-OPEC oil, are interested in how rapidly China's crude output will grow and how much oil Peking will export by, say, 1980. Japanese businessmen engaged in the China-Japan oil trade—presumably reflecting statements made by Chinese officials—have referred to imports of 20–30 million tons of Chinese crude oil "in a few years" and "roughly 60 million tons" in 5 years.[106] These figures are generally consistent with projections based on recent growth rates for crude oil production and consumption, and for exports and imports.

Data for 1971–74 show a 23-percent growth rate for production and a 20-percent growth rate for consumption.[107] These rates give the following projections for 1980:

	Million metric tons
Output	226
Consumption	179
Surplus	47

Thus, at recent growth rates, China would have a surplus for export of approximately 50 million tons in 1980. Should the Chinese desire to export larger quantities of oil by 1980, they could adjust the rate of growth of output, consumption, or both. A 2-percent reduction in the rate of growth in consumption, for example, would allow exports of 65 mmt in 1980. Thus, on the basis of recent growth rates the amount of Chinese crude available for export in 1980 could be 50 million tons. By making slight adjustments in consumption or output growth the Chinese could raise the surplus by 30 percent, to 65 million tons.

The rates of increase used above may reflect planned output, consumption, and exports in 1980. There is the possibility, however, that these rates have been influenced by current short-term considerations and therefore do not accurately reflect long-term plans. In this case, the above projections only give an idea of Chinese potential—not of

[104] NCNA, Shen-yang, Aug. 11, 1974.
[105] *Lloyd's List*, Apr. 20, 1974.
[106] *The Daily Yomiuri*, Aug. 30, 1974, p. 1 and *Sankei Shimbun*, Nov. 4, 1974, p. 1.
[107] Production grew from 36.7 million metric tons in 1971 to 65.3 million tons in 1974; consumption (production plus net imports) grew from 36.7 million tons in 1971 to 60 million tons in 1974.

their intentions. Intentions—China's desired output, consumption, and exports in 1980—must be derived from other data.

The most obvious factor bearing on China's desire to export crude oil is Peking's demand for imports, particularly of plant and equipment. If projections can be made of demand for foreign exchange and the level of non-petroleum exports, a figure for "desired" petroleum exports may be derived. The following calculation ignores a host of complicating factors and therefore should be regarded as very crude. Its main purpose is to illustrate the method, although it does give results which resemble those derived in the previous calculation.

From 1968 to 1973 China's imports grew by an average annual rate of 22 percent; exports grew by an average rate of 20 percent.[108] Projecting these two components at the given rates gives a trade deficit of $2.5 billion in 1980. At $10 per barrel of crude oil this trade deficit could be covered by crude oil exports of approximately 35 million tons in 1980. A price of $12 per barrel would lower the volume of desired crude oil exports to just under 30 million tons.

A revision upward of the level of desired imports and/or a decline in the rate of growth of nonpetroleum exports, ceteris paribus, would raise the desired level of crude oil exports in 1980. Both developments were evident in 1973 and 1974 when the Chinese made large purchases of plant and equipment, while the markets for their traditional export items contracted. Subsequently, in the second half of 1974, Peking pressed Japanese importers to take increasingly larger volumes of Chinese crude. In light of these events, the earlier projection of 50 million tons of crude oil exports in 1980 thus appears more realistic than the 30–35 million tons derived from data for 1968–73.

This sort of simplified analysis completely ignores Chinese financial policies—for example, their willingness to accept credits or to sell gold—which could lower the volume of desired crude oil exports. In all likelihood, however, Peking would prefer to close any growing trade gap by stepping up exports of crude oil.

A third factor bearing on China's crude oil exports in 1980 is China's ability to maintain the current rate of output (and consumption) growth. No one questions that reserves will support substantially higher rates of output, but there is less reason to assume that China can easily provide the investment resources to expand output at current or higher rates.

A constant rate of growth implies increments to output which grow in absolute terms and thus—if a constant capital-output ratio is assumed—growing levels of investment. For the 1950's, Dr. K. C. Yeh has calculated a capital-output ratio of approximately 500 yuan per ton of crude oil. This includes heavy investments in infrastructure—roads, railroads, et cetera—and therefore overstates current investment costs of increments to output. If a much smaller capital-output ratio of 100 yuan per ton is used[109]—to avoid overstating the investment costs—investment required to raise output from 65 million tons

[108] See Central Intelligence Agency, *People's Republic of China: International Trade Handbook*, September 1974, p. 9.

[109] The incremental capital/output ratio in 1960—assuming a two-year lag, where the increase in output for 1960 (1.8 million tons) is compared to investment in 1958 (342 million yuan was planned)—was 190 yuan per ton. The relative smallness of this figure, compared to 500 yuan per ton for the first plan period as a whole, can be partially explained by the decision to exploit shallow fields using traditional methods of extraction. As Peking backed off from these policies, costs probably rose somewhat and then began a steady decline as productivity increased.

in 1974 to 226 million tons in 1980 would be 16 billion yuan—roughly eight times the 1.9 billion yuan invested in the petroleum industry during 1953–57. By implication, the petroleum industry's share of investment would be roughly 10–15 percent of total investment in capital construction in 1975–80, and would require doubling the share of investment currently going to the petroleum industry.[110]

These rough calculations illustrate the magnitude of the effort required to increase output from 65 million tons in 1974 to 226 million tons in 1980. To do so will call for a substantial share of China's investment resources. For that reason—and given China's current economic difficulties—226 million tons probably should be viewed as the maximum rate of production that can be expected in 1980. Only if China were willing to tolerate foreign involvement in the development of its oil industry would a more rapid rate of growth appear feasible. This, however, appears unlikely.

Joint or Cooperative Development of Natural Resources

China's well-known policy of self-reliance is not a rigid rejection of all things foreign. Rather, it should be understood as a preference for domestically produced goods over imported goods and—in the case of imported goods—for cash payment over the acceptance of credits. On the issue of exploitation of natural resources, Peking has rejected all offers of assistance in developing its petroleum resources, and without a radical policy shift the Chinese will not agree to any arrangement which smacks of joint or cooperative development—of "putting resources on sale".[111] Both the flexibility of self-reliance and objections to foreign participation in the development of China's natural resources are evident in Teng Hsiao-p'ing's speech to the United Nations in April 1974:[112]

> By self-reliance we mean that a country should mainly rely on the strength and wisdom of its own people, control its own economic lifelines, make full use of its own resources, strive hard to increase food production and develop its national economy step by step and in a planned way. The policy of independence and self-reliance in no way means that it should be divorced from the actual conditions of a country; instead, it requires that distinction must be made between different circumstances, and that each country should work out its own way of practicing self-reliance in the light of its specific conditions. At the present stage, a developing country that wants to develop its national economy must first of all keep its natural resources in its own hands and gradually shake off the control of foreign capital * * *. Self-reliance in no way means "self-seclusion" and rejection of foreign aid. We have always considered it beneficial and necessary for the development of the national economy that countries should carry on economic and technical exchanges on the basis of respect for state sovereignty,

[110] This is derived by projecting GNP in 1977 (roughly the midpoint of 1975–80) to be 2.1 times that of 1955 (midpoint of 1953–57) and assuming that the investment/GNP ratios for the two periods were approximately the same. Thus 16 billion yuan would be approximately 13 percent of total investment in 1977—the result of dividing 8 by 2.1 and multiplying the result by 3.5 percent, the share of total investment allocated to the petroleum industry in 1953–57. Performing similar calculations for 1974 (as the mid-point of 1972–76), the investment required to raise output from 36.7 million tons in 1971 to 99 million tons in 1976 (a 22 percent rate of growth) would be 6.2 billion yuan (at 100 yuan per ton). This amounts to approximately 6 percent of national investment if we make the same assumptions as above and project GNP in 1974 at 2.05 times the 1955 figure. Neither of the required investment figures contains any allowance for investment to offset decline in output at older wells.

[111] China has accused the Soviet Union of putting its resources on sale; see the *Washington Post*, Feb. 23, 1974, A–11.

[112] *Speech by Chairman of the Delegation of the People's Republic of China, Teng Hsiao-ping, at the Special Session of the U.N. General Assembly*, Peking, Foreign Languages Press, 1974, pp. 15–16.

equality and mutual benefit, and the exchange of needed goods to make up for each other's deficiencies.

At various times in 1974, China was rumored to be relaxing the rule against accepting outside assistance.[113] To date, however, we have no firm evidence that China has entered into any agreements that could be described as calling for "joint" or "cooperative" undertakings in China.

Should China's development plans require oil output in 1980 to be higher than the 226 million tons projected above, the pressures to accept some form of foreign participation in the development of its oil industry would grow. In the absence of very strong pressures of this sort, Peking will continue to rely on its own efforts, perhaps obtaining technical aid from the national oil companies of other LDC oil producers. In December 1974, T'ang K'o, Vice Minister of Fuel and Chemical Industries, visited Venezuela, Mexico, and Trinidad-Tobago and talked to oil industry officials in each of those countries. Dealings with international oil companies and other major equipment manufacturers probably will be limited to straightforward purchases of equipment and technology, and perhaps services.

Appendix A

Regional Prospecting and Development

Geological surveys conducted in China before 1949 had identified 18 sedimentary basins, with a total area of more than 2.6 million square kilometers (sq km), which were possible commercial sources of crude oil. Five large basins—the Dzungarian, Tsaidam, Szechwan, North Shensi, and Tarim Basins—and the smaller Chiu-ch'uan (North Kansu) Basin were considered particularly promising. They included the three known oilfields in China, the Yu-men oilfield in the Chiu-ch'uan Basin, Tu-shan-tzu in the Dzungarian Basin, and the small oilfield at Yen-ch'ang in the North Shensi Basin. By 1949, information on these basins was still fragmentary, and none of the areas, including the oilfields, had been thoroughly explored.

Under the First Five-Year Plan, more than half of the 1.9 billion yuan invested in capital construction in the petroleum industry was allocated to prospecting. This investment resulted in the discovery of new oil deposits at Karamai in the Dzungarian Basin, in the area around Mang-yai in the Tsaidam Basin, and in the Szechwan Basin; and Peking obtained greater knowledge of the potentials of the six basins. It also led to the discovery of large deposits in the Manchurian province of Heilungkiang.

With the discovery of Ta-ch'ing, both men and equipment were shifted to Heilungkiang, leaving only skeleton crews behind to develop the older fields. Subsequently, in the mid-1960's, men and equipment were shifted on to Sheng-li and Ta-kang in the North China Basin. Only in the late 1960's did Peking once again allocate a significant share of resources to the development of oil reserves in the West and Northwest.

The limited supplies of techniques and modern equipment, and the low level of technology available to the Chinese petroleum industry has meant a strict ordering of priorities. Until recently, rapid development at more than one field was impossible. Today, with the large investments that have gone into training personnel and producing equipment, shortages are less severe. Peking can now proceed with the development of several oilfields simultaneously.

The following discussion provides some particulars on the various oil-producing regions. Although the available information is sketchy, the section illustrates the impact of new oil discoveries and the consequent shifting of resources from region to region during the past 25 years.[114]

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[113] See, for example. *Yomiuri Shimbun*, June 6, 1974.
[114] For details on the geology of the various regions, see Meyerhoff, *op. cit.*

Chiu-ch'uan Basin

The Chiu-ch'uan Basin is a small basin with an approximate area of 100,000 square kilometers. The Yu-men oilfield is located at the northern edge of the basin, about 35 kilometers southwest of the town of Yu-men, Kansu Province. Drilling began there in 1939 and by 1957 Yu-men was China's largest producer of oil.

The oilfield consisted of two producing areas in 1957, the original one at Lao-chun-miao and an adjacent area at Shih-yu-kou where drilling began in 1955. Production from these two areas in 1957 was about 755,000 tons, accounting for 89 percent of the natural crude oil produced in China and 52 percent of China's total petroleum output.[115] The increase in production—from a pre-1949 peak of 89,000 tons—came from several sources: a large increase in the number of wells, a program of water and gas injection initiated in 1954, expansion of the field, and the discovery of new oil strata.[116]

Two additional areas—Ya-erh-hsia, discovered in 1956, and Pai-yang-ho—were developed in the late 1950's.[117] When Ya-erh-hsia went into full production—presumably in 1960 or 1961—output at Yu-men was expected to double.[118]

The hastiness with which Yu-men was exploited, both in the pre-1949 period and during 1958–59,[119] resulted in considerable damage to the oilfields. This partially explains the sharp decline in output that occurred during the early 1960's[120]—a decline that was further accentuated by the shutting in of a large number of low-output wells. In 1965, output at Yu-men was less than one-third that of 1959, or approximately 400,000 tons compared to more than 1.3 million tons.

Activity in the basin began to pick up in the late-1960's. During and after the Cultural Revolution there was a pronounced effort to restore output at old wells, and in some instances wells which had been abandoned a decade earlier were reworked and resumed production. New oil-bearing strata have also been opened. In 1966 Shih-yu-kou oilfield registered a 47-percent increase in output; and in early 1970 NCNA reported that since the late 1960's the Shih-yu-kou field had been expanded by one-third and its output of crude oil had doubled.[121] In 1973 it was reported that two new oilfields were being developed and would soon be in production.[122] As a result of this renewed interest in Yu-men, output has risen from approximately 420,000 tons in 1969 to more than 700,000 tons in 1974.

Dzungarian Basin

The Dzungarian Basin lies between the T'ien-shan and Altai mountains in northern Sinkiang Province and covers an area of approximately 180,000 square kilometers. The Tu-shan-tzu and Karamai oilfields are located in the western part of the basin. Only limited exploration has been conducted in the eastern two-thirds of the Dzungarian.

Tu-shan-tzu Oilfield

The Tu-shan-tzu oilfield is located on a prominent structure about 15 kilometers southeast of Wu-su. Soviet engineers and geologists employed by the Sinkiang government began development at Tu-shan-tzu in 1938. Evaluations made in 1938–43 indicated that the structure was promising, but the known oil sands were thin and irregular.[123]

In 1943, the Soviet operators were dismissed and returned to the U.S.S.R., taking their machinery and equipment with them. The oilfield operated intermittently thereafter until 1950, when the joint Sino-Soviet Petroleum Co. was formed.[124]

Production at Tu-shan-tzu in 1957 was probably 50,000–60,000 tons—approximately 7 to 8 percent of production at Yu-men. Communist investment at Tu-shan-tzu was small in comparison with investment at Yu-men, and was mainly directed toward rehabilitation of the oilfield. One new oil stratum was discovered in 1956, and a small-scale program for secondary recovery was instituted.

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115 For output at Yu-men, see the table at the end of this appendix.
116 *Jen-min hua-pao,* January 1956.
117 SCMP, No. 1990, pp. 7–8.
118 NCNA, Peking, Mar. 4, 1959.
119 *Jen-min jih-pao,* Oct. 29, 1956 (hereafter cited as JMJP).
120 *JMJP,* Apr. 13, 1964, p. 5; translated in JPRS: 24,685, May 20, 1964.
121 NCNA, Lan-chou, Dec. 13, 1966; FBIS, Mar. 23, 1970, H–1.
122 *Eastern Horizon,* vol. 12, No. 6, 1973, p. 6.
123 *Ti-li chih-shih* (Geographical Knowledge), September 1956, pp. 11–12.
124 SCMP, No. 1147, p. 32; *China Reconstructs,* November 1956, p. 7.

Production at Tu-shan-tzu probably did not increase substantially during the Second Five-Year Plan, and there are no indications that new oil strata of commercial value were discovered in subsequent years. Instead the Chinese probably focused on the more promising, and nearby, Karamai oilfield.

Karamai Oilfield

The Karamai oilfield is located in the western part of the Dzungarian Basin, approximately 150 kilometers north of Tu-shan-tzu and 40 kilometers west of the Manass River. The first exploratory well was drilled there in 1955, and oil was struck in November of that year.[125] A second well was completed in April 1956. Following these discoveries, development accelerated, and by August, 20 wells had yielded oil, most of them producing 10–20 tons daily.[126] Four times as much drilling was scheduled for the 1957.[127] Discoveries were made at Karamai; at Wu-erh-ho, 100 kilometers to the northeast; and near Chung-kuai, about 60 kilometers to the southeast. By the autumn of 1956, reserves at Karamai (most likely the Chinese version of proved reserves) were said to be more than half the reserves at Yu-men; potential reserves appeared to be several times those at Yu-men.[128]

The Chinese invested heavily in the development of infrastructure for Karamai during the 1950's. The costliest item was a 147-kilometer pipeline connecting Karamai with the refinery at Tu-shan-tzu. It went into operation early in 1959.[129] A highway was completed from Tu-shan-tzu to Karamai in 1956; a branch line of the Lan-chou-Sinkiang railroad was expected to reach the oilfield by the end of 1959. And an 8-inch water pipeline was constructed from the Manass River to the oilfield in 1957.

The outlook for Karamai, and for China's oil industry, was bright. Production officially began in 1957, output probably not exceeding 50,000 tons. A goal of 3 million tons for 1962 was announced.[130] Output may have risen to 600,000 tons in 1959, but by 1962 appears to have been no more than 200,000 tons—far below target.[131]

Karamai's disappointing performance can be explained in terms of Great Leap Forward policies and new, more attractive, discoveries in the Sung-Liao Basin. With the push for output during the Leap Forward, management at Karamai concentrated on exploiting shallow pools.[132] The result was a rapid rise in output that could not be sustained. Soon, the shallow pools were depleted and output fell. Emphasis on output may also have resulted in some damage to the larger reservoirs at the oilfield.[133] However, an additional factor may provide a better explanation of Karamai's slow growth. In 1960, large oil reserves were discovered in the Sung-Liao Basin in the Northeast. Those reserves, located much closer to the large industrial and population centers, were economically more attractive. Men and equipment were moved from other oilfields to the Northeast. The consequent loss of manpower and equipment thus helps to explain Karamai's decline. Compared to the oilfields in the Northeast and East, Karamai is a less economical source of crude oil. Output there is expanded as regional energy needs grow. No effort has been made to build Karamai into a field of national importance.

Crude oil production at Karamai reached approximately 525,000 tons in 1965 and in 1974 was slightly over 1 million tons. Much of this growth, until recently, appears to have come from the restoration of old wells; about 100 wells were restored to production in 1970.[134] During 1973, workers at Karamai began developing a new area.[135] In July and August 1974 daily output at Karamai rose 84 percent—presumably, largely on the basis of output from the new area, although some was due to restoration of old wells, and the number of wells in operation at the end of August was 63 percent higher than in July.[136] At yearend, output had reached approximately 1.4 million tons on an annual basis and was almost double the rate of output in the first half of the year.

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125 SCMP, No. 1727, p. 33.
126 *China Reconstructs*, November 1956, p. 8.
127 *Sinkiang jih-pao*, Aug. 7, 1956.
128 *Jen-min hua-pao*, September 1956, pp. 8–9; *Chieh-fang-chun hua-pao*, No. 67, Oct. 1, 1956, p. 24.
129 Y. I. Berezina, *op. cit.*, p. 49.
130 NCNA, Karamai, June 28, 1958.
131 For output at Karamai, see the table at the end of this appendix.
132 SCMP, No. 2163, p. 22; NCNA, Karamai, June 28, 1958.
133 SCMP, No. 3689, p. 20.
134 SCMP, 71–20, p. 213.
135 Sinkiang Regional Service, Urumchi, Dec. 12, 1973.
136 Sinkiang Regional Service, Urumchi, Sept. 13, 1974.

Tsaidam Basin

The Tsaidam Basin is located in the northwestern part of Tsinghai Province at an average elevation of about 2,800 meters. It has an area of only about 20,700 square kilometers.

The Chinese gave high priority to prospecting and exploration in the basin during the 1950's. Prospecting began in 1954, and in November 1955 the first major drilling project was undertaken at Yu-ch'uan-tzu.[137] The well, referred to as the first deep well at Tsaidam, struck oil on December 12, 1955. As at the other fields in the West and Northwest, efforts to develop Tsaidam were hampered by the lack of transportation facilities and other infrastructure, making development very costly. Transportation charges alone accounted for 70 percent of drilling costs.[138] The Lan-chou-Sinkiang railroad was extended to An-hsi in December 1956, new roads were constructed, and 172 kilometers of water pipeline were installed. Exploratory activity was stepped up in 1956 and 1957; and in August 1957 it was reported that 63 of the more than 100 wells drilled had produced some oil or gas.[139]

At the end of 1958, NCNA announced that two big oilfields and three gasfields had been discovered in the basin that year. Eight other oilfields had been proved commercially valuable.[140] Reserves were estimated to greatly exceed reserves at Yu-men. On several structures in the Leng-hu and Yu-sha-shan areas, crude oil reserves per square kilometer were more than double those at Karamai.[141] Since prospecting began in 1954, 229 of the 291 wells drilled had either gushed oil or had shown signs of gas.[142] Of the eight exploratory wells drilled on structure No. 5 at Leng-hu in 1958, two wells gushed over 200 tons daily, and the daily output of one reached 800 tons.[143]

Following the discoveries at Leng-hu, the Tsinghai authorities decided to concentrate development efforts in that region of the basin. Reserves at Leng-hu were estimated at 150 million tons and an output of 3 million tons was planned for 1962.[144] Development began in 1959, 5 years after prospecting had begun in the Tsaidam.

Plans for the rapid development of Leng-hu apparently were abandoned when men and equipment were suddenly shifted to the Sung-Liao Basin. After a few years, output at Leng-hu began to decline.[145] Theodore Shabad has noted the changing administrative status of the oil-producing areas of Tsinghai and the implicit declining importance of the Tsaidam Basin in national plans during the early and mid-1960's.[146] Scattered data for recent years indicate an annual output of approximately 500,000 tons of crude oil in 1974.[147]

Since the development of Ta-ch'ing, a greater share of the industry's men and equipment has been shifted back to Tsaidam. Large-scale geological prospecting began again in 1966. In 1969, drilling teams from Ta-ch'ing were sent to the western portion of the basin,[148] and by 1972 a new oilfield had been constructed. The area of newly verified oil-bearing structures was reported as four times the 1965 figure, and the basin's crude oil production capacity was announced as three times that of 1969.[149] Part of the new oilfield was located in Min-ho Hsien; a 30,000 tons per year refinery was built there in 1970,[150] and eight wells there were reported as having produced 600 tons of crude oil in the 3 years 1970–72.[151] In those 3 years crude oil output in the basin doubled.[152] At Leng-hu and throughout the basin, increased output from old wells alone was said to account for 10-percent growth each year.[153]

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137 NCNA, Peking, Dec. 8, 1958; *Tsinghai jih-pao,* Aug. 23, 1957, p. 1.
138 SCMP, No. 1485, p. 27.
139 *Tsinghai jih-pao,* Aug. 23, 1957, p. 1.
140 NCNA, Peking, Dec. 8, 1958.
141 *Ibid.*
142 NCNA, Peking, Dec. 14, 1958.
143 NCNA, Peking, Dec. 8, 1958.
144 Theodore Shabad, *China's Changing Map,* New York, Praeger, 1972, p. 326.
145 *JMJP,* Mar. 12, 1973.
146 Shabad, *op. cit.*, p. 327.
147 For output in the Tsaidam, see the table at the end of this appendix.
148 *Peking Review,* Nov. 26, 1971, p. 9.
149 FBIS, Mar. 19, 1973, B–2.
150 FBIS, Oct. 26, 1972, H–1.
151 FBIS, Oct. 10, 1972, H–4.
152 *JMJP,* Mar. 12, 1973.
153 FBIS, Mar. 19, 1973, B–2; *JMJP,* Oct. 13, 1973, p. 2.

SZECHWAN BASIN [154]

The Szechwan Basin occupies an area of about 160,000 square kilometers in central Szechwan Province. By the late 1950's the basin had been producing small quantities of oil and gas for many years, and several gasfields had been developed in the area around Ch'ung-ch'ing.

The new PRC government began prospecting in Szechwan as early as 1951, and in 1953 four test wells were drilled in the northern and central part of the province. Exploration activity continued throughout the period of the FFYP. The effort expended on exploration in Szechwan was considerably less than that expended in the Tsaidam and Dzungarian Basins. Late in 1957 a general geological investigation of the basin was completed, and more than 100 possible oil-bearing formations were discovered. The major discoveries in the area, however, were natural gas fields.

In March 1958, oil was discovered at Lung-nu-ssu in central Szechwan. Not long afterwards, test wells at Nan-ch'ung and P'eng-lai also struck oil. By the end of June, about 50 wells were in operation—20 at the three places mentioned above and 30 elsewhere. A total of 200 wells were planned for 1958. Initial rates of flow and the announced plans for a 300,000-ton refinery at Nan-ch'ung indicated that the potential resources of the area were considered to be very good. Production was planned at 10,000 tons in 1958,[155] and a tentative goal of 250,000 tons was set for 1962.[156] More recent information is not available—probably reflecting a decision to abandon plans for the development of oil resources in Szechwan in favor of natural gas.[157]

NORTH SHENSI BASIN

The North Shensi Basin is the site of China's oldest oilfield, Yen-ch'ang. The basin, with an area of about 210,000 square kilometers, is located north of the Tsin-ling Mountains which separate it from the Szechwan Basin. During the 1950's the Chinese were interested primarily in restoring output at the oilfield. Improved techniques and new wells increased production to about 5,000 tons per year in 1957.

In recent years, an attempt has been made to expand output at Yen-ch'ang. A report in 1972 said that Yen-ch'ang produced more oil in half a month than it did in the entire year of 1949; output at the 8 months mark was up by 30 percent over 1971 and had risen by 70 percent in the previous 2 years.[158] Thus, output in 1972 probably was no more than 120,000 tons.[159]

TARIM BASIN

The Tarim Basin in southern Sinkiang, with an area or more than 520.000 square kilometers, is the largest and least known petroliferous area in China. Oil and gas seepages have long been observed in the area and were exploited on a small scale in the pre-Communist period. Preliminary geological investigation revealed a section of several thousand meters of sedimentary beds in the western part of the basin; oil and gas seepages were mapped for a distance of 800 kilometers in the Aksu-Kashgar region. Early evidence indicated favorable prospects for the discovery of commercial oil deposits in the northwestern third of the basin. The new PRC government paid little attention to the Tarim Basin before 1956, when it completed an aerial survey of the western part of the basin. In 1957, exploration of the Takla-Makan Desert began. NCNA reported that the first test well drilled on the Ichikrik structure in the basin gushed 25 tons of crude oil in 12 hours on October 9, 1958 and more than 100 tons in 24 hours on October 10.[160] Despite the probable existence of commercial oil deposits in the region, the location of the basin has discouraged its development.

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[154] Much of the information in this section is taken from *China Reconstructs*, November 1958, pp. 20–21 and *China Pictorial*, October 1958, pp. 8–11.
[155] Another source says 50,000–120,000 tons.
[156] *JMJP*, Mar. 25, 1958, p. 3.
[157] See appendix B, table 2.
[158] SCMP, 72–47, p. 22.
[159] Assuming that output in 1949 was the same as in 1957, which is unlikely.
[160] NCNA, Peking, Oct. 17, 1958.

SUNG-LIAO BASIN

The Sung-Liao Basin in the Northeast has an area of approximately 250,000 square kilometers, stretching along the reaches of the Sungari and Liao Rivers. By 1959 a number of oil-bearing structures had been located with the assistance of Soviet and Hungarian experts.[161] Men and equipment were hurriedly brought in from other fields, and by May 1959, thousands of workers had arrived at Sung-Liao. The new discoveries at Sung-Liao had implications that were fully appreciated by officials in the Ministry of Petroleum Industry:

"In the plain there are deep, thick layers of sedimentary rock from the Mesozoic and Cenozoic eras. The discovery of oil and sand strata is of great significance, as vast stretches of the eastern part of China, including the North China Plain, the Northern Kiangsu Plain and the Pohai Bay, are of the same geological structure as the Sung-Liao Plain." [162]

In the first 8 months of 1960 a number of exploration and production wells were drilled at the new field, named Ta-ch'ing, and approximately 400,000 tons of crude oil were produced in 1960 and shipped south by rail to the industrial centers of Kirin and Liaoning.[163] The size of the oil deposits was confirmed by the end of 1960, and by the end of the following year the oilfield was in operation.[164] In 1963, output reached over 2 million tons and China became "basically self-sufficient" in oil.[165]

With the exception of the years 1966–68, when transportation and other disruptions associated with the Cultural Revolution limited output, Ta-ch'ing grew rapidly. In 1970, output was 2.5 times that of 1965. The rate of increase began to taper off in the early 1970's, but following the opening of new areas in 1973—which increased capacity by 65 percent [166]—the growth rate turned up. Water injection, begun early in the life of the field, helped to maintain output at Ta-ch'ing's older wells and thus forestalled the characteristic sharp decline in output that occurs early in the production history of most fields. In 1974, Ta-ch'ing produced approximately 20 million tons of crude oil—30 percent of national output.

It is difficult to overstate the significance of Ta-ch'ing for China. The discovery of large oil reserves in the Northeast meant a cheaper and guaranteed oil supply for a large segment of the country's industry. It also freed China from dependence on Soviet oil at a time when the Sino-Soviet dispute was becoming increasingly bitter.

Also important was the symbolism. Ta-ch'ing was at least partial proof that China did have large oil reserves— and thus served to refute the "imperialist theory that China was poor in oil". Furthermore, it was a classical demonstration of the superiority of man (versus machine). Success had been achieved in the face of normally crippling material shortages and under extremely harsh physical circumstances. This symbolic importance probably was an important consideration in the adoption of Ta-ch'ing in 1964 as a model for industrial development.

NORTH CHINA BASIN

The geological similarity of the North China and Sung-Liao Basins doubtless led the Chinese to begin exploration of the North China Basin shortly after verifying the size of the discoveries at Ta-ch'ing. By the mid-1960's the correctness of this decision was apparent. Major new discoveries resulted in the development of China's second and third largest oil producers—Sheng-li and Ta-kang.

Sheng-li Oilfield

Sheng-li, located in northern Shantung Province along the lower reaches of the Yellow River as it empties into the Pohai Gulf, began production in May 1964.[167] In 1965, output reached 700,000 tons. Activity at the oilfield accelerated

[161] NCNA, Ch'ang-ch'un, May 5, 1959.
[162] *Ibid.*
[163] FBIS, Jan. 8, 1973, B–1. For output at Ta-ch'ing, see the table at the end of this appendix.
[164] FBIS, Jan. 4, 1973, B–1.
[165] FBIS, Jan. 7, 1966, ccc–1.
[166] SWB, W757, Jan. 9, 1974, A–5.
[167] FBIS, May 20, 1974, G–8. For output at Sheng-li, see the table at the end of this appendix.

during the Cultural Revolution. In 1974, crude oil output was approximately 11 millions tons—about 17 percent of China's total crude oil production. Surveying and construction began in two new areas in 1973, and a "long-distance" pipeline—probably linking the oilfield with the port of Huang-tao, near Tsingtao, where new oil-handling facilities have been constructed—was completed and put into use in 1974.[168] Production targets were raised sharply in 1974. An added push in the fourth quarter raised daily output in December to a level 40 percent higher than the highest daily output in 1973.[169]

Ta-kang Oilfield

Ta-kang oilfield, situated along the coast in southern Tientsin Municipality and adjacent Hopeh Province, may possess the largest reserves of any oilfield in China.[170] The Chinese have reported that Ta-kang has rich resources of oil and natural gas, with thick oil-bearing strata of high permeability. Its crude oil is reported to be "of good quality and high industrial and economic value."[171]

Prospecting began at Ta-kang in the spring of 1964. After the first well gushed oil, a series of "deep" exploratory wells were planned to determine the area of oil-bearing structures. However, drilling crews encountered unexpected difficulties. They discovered that the field is severely faulted and has complex formations. Oil bearing strata vary greatly in thickness, appearing or disappearing irregularly, and biogenetic limestone was encountered in some areas. These problems were eventually solved. The faulting had some beneficial aspects, and the biogenetic limestone was found to contain sizable quantities of oil and gas. This extended period of learning how to exploit Ta-kang may explain why output currently is only one-third output at Sheng-li, despite the fact that development of the two fields began at approximately the same time.

Between 1967 and 1973, crude oil output at Ta-kang grew by an average 60.9 percent annually; in 1974, crude output rose by 24.7 percent to reach almost 4 million tons. Ta-kang now appears to be China's third largest producer of crude oil and an important source of natural gas.

Other Oilfields

China has other oilfields about which little or nothing has been revealed in the official press. Some information has leaked out on a field in Hupeh Province, Fu-yu in Kirin Province, P'an-shan in Liaoning Province, I-tu oilfield (reportedly in Shantung Province), and the fields in Kwangtung Province near Canton.

Hupeh

References to an oilfield in Hupeh Province, near Sha-shih, appeared in Western publications as early as 1968.[172] In the summer of 1974 Japanese press reports said that the Chinese were going to develop fields in Shantung (called the "913" field) and in Hupeh (called the "57" field).[173] To date, however, reports on industrial output in Hupeh make no mention of the production of crude oil. A publication of Japan External Trade Organization estimates reserves in Hupeh at 600 million tons in 1973; production is estimated at 2 million tons in that year.[174] This information suggests that development of Hupeh oil began in the late 1960's but was postponed either because the discovery was disappointing or because Peking decided to concentrate development resources on the fields in the East and Northeast.

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[168] FBIS, Sept. 30, 1974, G–4.
[169] FBIS, Dec. 10, 1974, G–7.
[170] FBIS, July 26, 1974, C–1. For output at Ta-kang, see the table at the end of this appendix.
[171] *Peking Review*, May 24, 1974, p. 15.
[172] K. P. Wang. "The Mineral Industry of Mainland China," *Preprint from the 1968 Bureau of Mines' Minerals Yearbook*, pp. 1 and 12.
[173] *Wen Wei Pao*, Hong Kong, July 31, 1974, p. 1.
[174] Japan External Trade Organization, *China Economic Research Monthly* (in Japanese), No. 9, 1974, pp. 16–17.

Kirin

In May 1972, *China Reconstructs* disclosed the existence of an oilfield in Kirin Province.[175] The field is probably near the city of Fu-yu, directly north of Ch'ang-ch'un and close to the Heilungkiang border.[176] This would place the field in the southern edge of the Sung-Liao Basin.

Output at Fu-yu is not known. The article that reported the existence of the field complained that the planners of the "medium-sized" refinery serving the field kept enlarging the size of the refinery, finally settling on 350,000 tons. The date of the refinery construction is not mentioned; it could have been in the late 1960's. In the first quarter of 1971, crude output in Kirin Province was reported as double that of the first quarter of 1970.[177] This suggests an oilfield in the early stages of development. Output in 1974 may have been on the order of 2 million tons.

P'an-shan

Existence of an oilfield in the P'an-shan area of Liaoning Province, near the mouth of the Liao River, was hinted at by Chao An-po, secretary of the Sino-Japanese Friendship Association, during a trip to Tokyo in 1964.[178] Although he implied that P'an-shan would be developed posthaste, no evidence shows that this occurred. Suspicions that oil had been discovered there were strengthened when, between 1965 and 1969, the area around P'an-shan was transferred to direct provincial administration. Presumably the structures there are extensions of those being developed at Ta-kang and Sheng-li.

In the first half of 1973, crude oil output in Liaoning Province was up by 48 percent over the first half of 1972; natural gas output was up by 30 percent.[179] This suggests an oilfield in the early stages of production. Most likely, P'an-shan began official production only in 1972 or 1973 and did not produce more than 1 or 2 million tons in 1974.

I-tu

The Hong Kong *Ming Pao* in late 1973 reported the existence of an I-tu oilfield in Shantung Province.[180] It was said to be a "giant" oilfield which was discovered in October 1970 and began partial production in the second half of 1971. NCNA has also mentioned an I-tu oilfield, but without giving its location. There is an I-tu city half-way between Tzu-yu and Wei-fang in Shantung, not too far from the Sheng-li oilfield. If the *Ming Pao* report is correct, I-tu could have produced 1 to 2 million tons of crude oil in 1974.

In late 1974, reports circulated of oil discoveries in South China's Kwangtung Province. One source was published in China and therefore can be regarded as authoritative.[181] However, it gave no location for the discovery. A second source said that oil had been discovered near the estuary of the Pearl River and at San-shui west of Canton.[182] Finding commercially valuable reserves in Kwangtung would represent a major breakthrough; heretofore the only local source of oil has been the shale oil plant at Mao-ming. A large portion of locally consumed oil has been shipped in by rail and ship from the East and Northeast—as well as from Eastern Europe and the Middle East.

NCNA, in its year-end wrap-ups frequently refers to the discovery of new oilfields. Thus the list of fields presented in this appendix may well be incomplete.

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175 P. 37.
176 See Hirotada Eto, "Energy Resources of the People's Republic of China," *Japan Science and Technology*, Vol. 13, No. 1, 1972; translated in JPRS: 55470, Mar. 17, 1972, p. 3.
177 FBIS, May 5, 1971, G–2.
178 SWB, W251, Feb. 19, 1964, B–26.
179 FBIS, July 18, 1973, G–1.
180 Nov. 15, 1973.
181 Wu Yu-wen, *Kwangtung ti-li kai-k'uang* (Geographical outline of Kwangtung), June 1973; translated in JPRS: 63200, Oct. 15, 1974, p. 35.
182 *Sing Tao jih-pao*, Hong Kong, Sept. 23, 1974.

Output at Ta-ch'ing Oilfield

[Million metric tons]

	Millions of metric tons		Millions of metric tons
1960	0.4	1968	5.4
1961	---	1969	7.4
1962	---	1970	10.0
1963	2.3	1971	12.6
1964	---	1972	14.4
1965	4.0	1973	15.9
1966	5.1	1974	19.4
1967	---		

Sources and derivation:

There is a relative wealth of information on Ta-ch'ing. Still, many assumptions must be made and extrapolations must be based on incomplete data to arrive at a time series for output. The Chinese have never announced an absolute figure for total output at Ta-ch'ing. Conventional wisdom has it that Ta-ch'ing produces one-third to one-half of China's crude oil output. The estimates shown here are based on an assumed output of 10 million metric tons at Ta-ch'ing in 1970. Of the estimates (really "guesstimates") that I have seen, the 10 million tons figure appears most reasonable; it represents 35 percent of China's crude oil output for 1970. Output in the remaining years is based on this 10 million tons for 1970 and announced growth rates for Ta-ch'ing gathered from the Chinese press.

1960: Output in the eleven-year period 1960–71 grew at an average annual rate of 35.2 percent (FBIS, 4 Jan 1973, B–8). The number derived from the 1971 figure of 12.6 million tons is 457,000 tons. I have chosen to round this figure down to 400,000 tons. To those who may doubt that Ta-ch'ing produced a significant quantity of oil in 1960, I refer to the statement, "At the end of the year (1960), hundreds of thousands of tons of oil were produced . . ." (FBIS, 8 Jan 73, B–1.)

1963: Output in 1971 was more than five times output in 1963 (FBIS, 4 Jan 73, B–8). I assume that 1971 output was 5.5 times that of 1963. If 5.1 is used, the difference in the rseults is minimal—2.47 compared to 2.29.

1965: Output in 1970 was 2.5 times that of 1965 (*Peking Review,* 50, 10 Dec 71, p. 16).

1966: Output for the first 9 months of 1966 was 26.6 percent higher than output for the same period of 1965 (*China Reconstructs,* Jan 1967, p. 7). This partial year figure is used for the entire year; the same procedure is followed throughout whenever growth rates for the complete year are unavailable.

1968: Based on the statements that production at Ta-ch'ing in 1968 reached an all-time high and that the state plan for crude output was fulfilled 12 days early (FBIS, 2 Jan 1969, F–7). Assuming planned output was at least 5.2 million metric tons, and that this was overfulfilled by 12 days' output (3.3 percent), output for 1968 would be 5.4 million metric tons.

1969: Output was 37 percent above that of 1968 (FBIS, 11 Feb 1970, G–1).

1970: Assumed to be 10 million metric tons.

1971: Output was 26 percent over 1970 (FBIS, 12 Apr 1972, B–7).

1972: Output was 14.5 percent over 1971 (CMP–SCMP–73–18, p. 213).

1973: Output was 10 percent over 1972 (BBC, Summary of World Broadcasts, Far East, W757, A–5, 9 Jan 1974).

1974: Output was 22 percent over 1973 (FBIS, 26 Dec 1974, K–3).

Output at Ta-kang Oilfield

	Metric tons
1966	(1)
1967	200,000
1973	3,000,000
1974	3,740,000

[1] Production began.

Sources and derivation:

1967: Based on output estimate for 1973 and announced average annual growth rate of 60.9 percent for 1967–73 (*China Reconstructs,* Oct 74, p. 8).

1973: China Reconstructs, Oct 1974, p. 8, reported that output at Ta-kang "over the past eight years was 3.1 times the total for the whole of China in the 42 years from 1907 to 1949." Output during 1907–49 has been reported as 2.78 million metric tons in Chang Ta-yu and Chu Pao-lin, "China's advances in petroleum and synthetic petroleum science during the past decade," *Jan-liao Hsueh-pao* (Acta Focalia Sinica), Vol. 4, No. 4, 1959, pp. 263–81, translated in JPRS: 5642, 13 Oct 1960. Thus total production at Ta-kang, beginning in 1966 and including 1973, was 8.618 million metric tons.

To estimate output in 1973, the problem can be conceptualized as solving for the area of a triangle where area = ½ base x height and area is total output for 1966–73, or 8.618 million metric tons. Let base equal number of years of production and height equal output in 1973. Since *China Reconstructs* dates rapid growth as between 1967 and 1973, I set b equal to 6. Solving the equation for h, we get h = 2.87 million metric tons. This is an inexact method; thus I have rounded the estimate up to an even 3 million metric tons.

1974: Output increased by 24.7 percent in 1974. (FBIS, 2 Jan 1975, K–3).

Output at Sheng-li Oilfield

	Metric tons
1964	(1)
1965	700,000
1973	9,500,000
1974	11,000,000

[1] Began delivery to state.

Sources and derivation:

1965: Based on the estimate for 1974 and the report that output in 1974 was "some 15 times" the 1965 figure (FBIS, 7 Jan 1975, G–10).

1973: Based on the report that output at Sheng-li, 1964–73 (inclusive) was 16.8 times the 42-year total of old China (2.78 million tons). This implies output of 46.7 million tons for 1964–73 and an output of approximately 9.3 million metric tons in 1973—rounded up to 9.5 million tons. For the source of the output figure for "old China" and the estimating procedure, see the note for 1973 in the table on output at Ta-kang. The surce reporting Sheng-li's total production, 1964–73, mistakenly says 16.8 "percent of"; obviously it should read 16.8 "times" (FBIS, 4 Dec 1974, G–7).

1974: Output increased 16 Percent in 1974 (FBIS, 7 Jan 1975, G–10).

Output at Karamai Oilfield

	Metric tons		Metric tons
1957	50,000	1966	---------
1958	250,000	1967	---------
1959 (plan)	600,000	1968	---------
1960	---------	1969	323,000
1961	---------	1970	384,000
1962	201,000	1971	503,000
1963	---------	1972	604,000
1964	---------	1973	725,000
1965	523,000	1974	1,036,000

Sources and derivation:

1957: Of the 94,000 tons produced in Sinkiang (Nai-ruenn Chen. *Chinese Economic Statistic,* p. 204), some 50,000 were produced at Karamai. Tu-shan-tzu produced 100,000 tons in 1952 (*JMJP*, 14 Jan 1956) and probably no more than 40,000–50,000 in 1957.

1958: Sinkiang produced 350,000 tons in 1958 (Chen, *op. cit.,* p. 204); assuming Tu-shan-tzu produced no more than 100,000 tons, Karamai produced approximately 250,000 tons.

1959: SCMP, 2132, 6 Nov 1959, p 27ff. It is assumed that most of the planned 670,000 tons for Sinkiang would be produced at Karamai.

1962: Estimated on the basis of the figure for 1965 and the statement that output in 1965 was 2.6 times (presumably) that in 1962; reported in NCNA, Urumchi, 28 Apr 1966 in SCMP, 3689, 28 Apr 1966, p. 20.

1965: Estimated on the basis of the statement that daily output at year-end 1974 was 200 percent higher than in 1965 (FBIS, 17 Dec 1974, M–5). The rate of output—on an annual basis—at year-end 1974 is estimated at 1,569,000 tons.

1969: Based on the 1970 output estimate and the report that output in the first half of 1970 was up 18.9 percent (FBIS, 6 Aug 1970, H–1).

1970: Based on the 1971 output estimate and the report that plan tasks were fulfilled 91 days early, implying a 24.9 percent overfulfillment of plan (Urumchi, Sinkiang Regional Service, 30 Dec 1971). Assuming the plan called for, say, a 5 percent increase, then output in 1971 was 31.1 percent above 1970.

1971: Based on output estimate for 1972 and assumed 20 percent growth in 1972.

1972: Based on output estimate for 1973 and assumed 20 percent growth in 1973.

1974: Derived from data in FBIS, 17 Dec 1974, M–5; FBIS, 30 Aug 1974, M–2; FBIS, 19 Sep 1974, M–1; Urumchi, Sinkiang Regional Service, 16 Dec 1974.

Output at Tsaidam Basin Fields

	Metric tons		Metric tons
1958	30,000	1971	180,000
1965	127,000	1972	320,000
1969	160,000	1973	442,000
1970	165,000	1974	530,000

Sources and derivation:

1958: Wu Yuan-li, *Economic Development and the Use of Energy Resources in Communist China,* p. 182.

1965: Output reportedly "increased year after year" (FBIS, 17 Sep 1971, H–3) during 1965–71; the figure for 1965 is based on an assumed annual growth rate of 6 percent, 1965–71, (as per 1969–71) and the output figure estimated for 1971.

1969: Output in 1970 was reported as 3 percent more than in 1969 (FBIS, 17 Sep 1971, H–3).

1970–71: At Leng-hu, which produces most of the oil produced in the basin, increased output from old wells raised output by 10,000 tons during the first 8 months of 1971

(*JMJP*, 13 Oct. 1971, p. 2. If we assume that increased output from old wells at Leng-hu raised total output 15,000 tons for all of 1971, and that this increase accounted for all of the reported 9.1 percent increase reported in 1971 (for 8 months, FBIS, 17 Sep 71, H–3), then total output for the basin in 1970 was approximately 165,000 tons and 180,000 tons in 1971—when it reportedly hit an "all-time high". This is roughly consistent with the statement that "added output of old wells is equivalent to one-tenth of the annual output for the whole basin", reported in FBIS, 17 Mar 1973, B–2.

1972: Output in 1972 was reported as twice that of 1969 (*JMJP*, 12 Mar 1973 in CMP–SCMP–73–12, p. 126).

1973: At the 8 month mark, output was 15 percent above plan (Peking, *Chung-kuo Hsin-wen*, 6 Oct 73, p. 2) ; assuming that the planned increase was 20 percent (slightly less than the 26 percent average annual rate for 1964–72 and the national rate of 26.7 percent for 1973), then output would have increased approximately 38 percent in 1973.

1974: Assumed to grow at same rate as national output—i.e., 20 percent.

Output at Yu-men Oilfield

	Metric tons		*Metric tons*
1939	420	1957	755, 381
1940	1, 353	1958	1, 002, 391
1941	11, 856	1959	1, 337, 190
1942	46, 518	1960	1, 700, 000
1943	61, 219	1961	1, 600, 000
1944	69, 153	1962	---------
1945	66, 060	1963	---------
1946	88, 647	1964	---------
1947	---------	1965	412, 000
1948	77, 920	1966	---------
1949	65, 137	1967	---------
1950	---------	1968	---------
1951	---------	1969	419, 000
1952	142, 649	1970	490, 000
1953 (planned)	198, 282	1971	544, 000
1954	---------	1972	620, 000
1955	413, 700	1973	676, 000
1956	533, 235	1974	710, 000

Sources and derivation :

1939–42: Tzu-yuan Wei-yuan-hui Chi-k'an (National Resources Commission Quarterly), Vol. I, No. 4, 1942.

1943–46: Hong Kong *Wen Hui Pao*, 8 (or 15) August 1949.

1948: Kansu Jih-pao, 1 Jan 1958, p. 2.

1949: Zukai Chu ko ku no Keizai, 20 Oct 1954.

1952: Kansu Jih-pao, 12 Jun 1958, p. 2.

1953: Zukai Chu ko ku no Keizai, 20 Oct 1954.

1955: Jen-min Hua-pao (Peking), Jan 1956, reported that output in 1955 was "almost three times 1952." I assume it was 2.9 times 1952.

1956: Kansu Jih-pao, 12 Jun 1958, p. 2.

1957: Ibid.

1958: NCNA, 3 Jan 1959.

1959: Joint Publications Research Service (JPRS) : 8497, 26 Jun 1961, p. 18.

1960: Assumed to have increased by 25 percent, slightly less than the 33 percent of 1959.

1961: Assumed to have declined by 4 percent, the same decline shown by national crude oil output.

1965: Derived from the estimate for 1971 and the statement that output in 1971 was 32 percent higher than that for 1965, reported in *Peking Review*, 5, 2 Feb 1973, p. 26.

1969: Estimated on the basis of a 17 percent increase for 8 months in 1970 ; FBIS, 20 Oct 1970, H–1.

1970: Estimated on the basis of an 11 percent increase in 1971 reported for Ya-erh-hsia : *Ching-chi Tao-pao*, Hong Kong, 19 Jan 72, p. 21.

1971: Estimated on the basis of the 14 percent output growth at the Shih-yu-kou field in 1972 (assuming a planned output increase of 5 percent), BBC, *SWB, FE*, W697, A–8, 1 Nov. 1972.

1972: Eastern Horizon, Vol. XII, No. 6, 1973, p. 21.

1973: FBIS, 17 Aug. 73, H–1 reported that output for the first half year was 4 percent over plan ; assuming the plan called for 4.7 percent increase in output (the rate achieved in 1965–71), then actual output would be 9 percent above that of first-half 1972. The 9 per-fraction of the plan to be attained in 7 months) equals 1.063, the plan called for an output in 1973 "increased by more than 10 times compared with that before liberation." The figure used here—676,000 tons—is 10.4 times output in 1949.

1974: At the end of July the oilfield had completed 62 percent of the annual plan—a 6 percent increase over the same 1973 period (FBIS, 11 Sep. 1974, M–1). Since 62÷58.3 (the fraction of the plan to be attained in 7 months) equals 1.063, the plan called for an output increase of only 1 percent or so. On this basis, and an announced 4 percent over plan for 8 months (FBIS, 8 Oct. 1974, M–3), I estimate that output in 1974 grew by 5 percent.

Appendix B

Synthetic Oil Production in 1974

Almost all of China's synthetic oil is produced in Fu-shun, Liaoning Province and at Mao-ming in Kwangtung Province. The Fu-shun No. 1 plant produces at most 2 million tons of oil from shale each year; [1] Fu-shun No. 2 plant produces another 800,000 tons.[2] Mao-ming has a refining capacity of 2.5 million metric tons,[3] but it processes only a nominal amount of shale oil—perhaps only 200,000–300,000 tons yearly. Thus China's total production of synthetic oil in 1974 probably did not exceed 3–3.5 million tons.

Petroleum Consumption

By Agriculture

Jen-min jih-pao, Apr. 14, 1960 [4] indicates that 5 million horsepower of internal combustion engines in the agricultural sector would consume 2.4 million tons of gasoline and diesel oil.

Each standard unit of tractor shown in table 4 is equal to 15 horsepower. Expressing the tractor units given in table 4 in horsepower (a total of 0.369 million horsepower in 1957 and 7.275 million horsepower in 1973) and multiplying by 0.48 tons gives the petroleum consumed by tractors in those 2 years—177,000 tons in 1957 and 3.492 million tons in 1973.

Applying the 0.48 ton figure to the data for pumps gives consumption figures of 110,000 tons in 1957 and 7.2 million tons in 1973. Assuming that tractors and pumps together accounted for almost all of the petroleum consumed by agriculture in 1957 and 1973, then total petroleum consumption in agriculture was 287,000 tons in 1957 and 10.7 million tons in 1973. This was 8.7 percent and 17.8 percent of total petroleum consumption in 1957 and 1973, respectively.

By Households

Niu Chung-huang, *Wo-kuo ti-i wu-nien chi-hua shih-ch'i sheng-ch'an ho hsiao-fei kuan-hsi*, Peking, Ts'ai-cheng ching-chi she, 1959, p. 57 gives household consumption of kerosene in 1957 as 190,000 tons—5.8 percent of total petroleum consumption in that year.

By Transportation and Industry

Yuan-li Wu, in his *Economic Development and the Use of Energy Resource, in Communist China*, New York, Praeger, 1963, p. 193, estimates that transportation and industry consumed approximately equal shares of the total petroleum supply in 1960. If we arbitrarily assume that the military consumed 5 percent of the petroleum supply, then the shares of transportation and industry can be estimated at approximately 40 percent each in 1957.

By Military

Arbitrarily assumed to be 5 percent in 1957.

Refining Capacity

The Chinese have never given an absolute figure for total refining capacity. Some recent statements are:

(1) "The oil-refining capacity added during the period 1960–69 was 8 times that (added) for the previous decade." [5]

(2) ". . . China's oil-refining capacity in 1973 reached 3.7 times that of 1965.[6]

(3) "The present oil-refining capacity is nearly 4 times that of 1965." [7]

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[1] FBIS, Mar. 18, 1974, G–3.
[2] *Hydrocarbon Processing*, April 1974, p. 107.
[3] *Kwang-ming jih-pao*, Oct. 19, 1971, p. 2, reported a 150 percent increase in capacity at Mao-ming. Initial capacity was 1 million tons (Yuan-li Wu, *op. cit.*, p. 183) and no further expansion occurred until the early 1970s.
[4] Translated in JPRS: 6389, Dec. 12, 1960, pp. 58–59.
[5] FBIS, Sept. 5, 1973, B–11.
[6] FBIS, Sept. 20, 1974, E–5.
[7] FBIS, Jan. 3, 1975, E–10.

Assuming that 2 million tons of refining capacity were added in 1950–59, capacity at the end of 1969 can be estimated at approximately 18 million tons.[8] Given the nature of the data, this is no more than an approximation.

Capacity estimates for 1973 and 1974 can be derived by taking the latter two statements and assuming (1) that China possessed the capacity to refine the 11.1 million tons of crude oil produced and imported in 1965, (2) that transportation and handling losses were 4 percent, and (3) that refineries ran at 89 percent capacity. The figures derived are 44.4 million tons of capacity in 1973 and 47.4 million tons in 1974 (where "nearly 4" is 3.95).

TABLE 1.—CHINA'S PETROLEUM IMPORTS

[In thousands of metric tons]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Total imports	210	733	608	868	875	1,582	1,732	1,802	2,507	3,294	3,296	3,043	1,995
U.S.S.R.[1]	210	733	608	868	875	1,582	1,732	1,802	2,507	3,048	2,963	2,928	1,856
Crude oil						378	397	380	672	636	568		
Products						1,204	1,335	1,422	1,835	2,412	2,395	2,928	1,856
Albania:													
Crude oil										[2] 11	[2] 21	[3] 56	[3] 105
Products													[3] 16
Romania: Products										[2] 235	[2] 312	[2] 59	[2] 18
Other:													
Crude oil													
Products													

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total imports	1,701	826	308	300	188	369	359	661	353	382	385	1,095
U.S.S.R.[1]	1,408	505	38	40	7	8	10					
Crude oil												
Products	1,408	505	38	40	7	8	10					
Albania:												
Crude oil	[3] 117	[3] 158	[4] (160)	(160)	(100)	(160)	(168)	(176)	(185)	(194)	(204)	(214)
Products	[3] 48	[3] 77										
Romania: Products	[5] 128+	[6] 86+	[7] 110	(100)	[8] (81)	(81)	(81)	[7] 84	[7] 71	[7] 88	(81)	(81)
Other:												
Crude oil								[9] 401	[10] 97			[11] 800
Products						[12] 120	[13] (100)			(100)	(100)	

[1] Data for 1950–54 were derived from data in M. I. Sladkovskiy, "Ocherki Ekonomicheskikh Otnosheniy SSR s Kitayem" (Moscow, 1957) translated in JPRS: 1384–N, Mar. 23, 1959, pp. 26 and 56. Those for 1955–59 are from K. C. Yeh, "Communist China's Petroleum Situation," Rand Corp. memorandum RM–3160–PR, May 1962, p. 43. The remaining data were taken from various issues of the U.S.S.R. "Trade Handbook."

[2] "Petroleum Press Service," March 1965, p. 89.

[3] Republika Popullore e Shqiperise, Drejtoria e Statistikes, "Vjetari Statistikor i R. P. Sh 1965" (Tirane, 1965), p. 318.

[4] No data are available for Albania after 1964. The closing of the Suez Canal in mid-1967 sharply curtailed both Albanian and Romanian exports to China. For the years 1968–73, I assume that Albanian crude exports regained their previous peak in 1968 and increased by 5 percent annually in subsequent years.

[5] "Suez Canal Report," 1963.

[6] "Suez Canal Report," 1964.

[7] Republica Socialista Romania, Directa Centrala Statistica, "Comertul Exterior al Republicii Socialiste Romania 1973," p. 76.

[8] Romania's exports to China during 1967–69 and 1973–74 are unavailable. The figure shown for those years is the average of the figures for 1970–72.

[9] United Arab Republic, Central Agency for Public Mobilisation and Statistics, "A.R.E. Foreign Trade 1970," p. 240.

[10] United Arab Republic, Central Agency for Public Mobilisation and Statistics, "A.R.E. Foreign Trade 1971," p. 240.

[11] China apparently stepped up imports from the Middle East in 1974. In July an African tanker unloaded oil at Ch'an-chiang in South China (FBIS, Sep. 24, 1974, H–1); in August the newly purchased T'ai-hu (formerly the Beauregard) unloaded 60,000 tons of oil at Ch'an-chiang (FBIS, Sept. 12, 1974, H–6). Assuming that China imported Middle Eastern oil at the rate of 60,000 tons a month, imports from the Middle East would have been 720,000 tons in 1974. I have rounded this up to 800,000 tons.

[12] United Arab Republic, Central Agency for Public Mobilisation and Statistics, "Monthly Bulletin of Foreign Trade, January/December 1968," p. 366.

[13] Following the closing of the Suez Canal, China began to import small but growing quantities of crude and products from the Middle East. I have arbitrarily set these unknown imports at 100,000 tons in those years when no other data are available.

Note: Since the 1950's, China has also imported negligible quantities of various petroleum products from countries not listed in the above table.

[8] The Lan-chou refinery, which accounted for almost all of the capacity added in the 1950s, was planned to reach a capacity of 2–3 million tons in 1959 (Wu, *op. cit.*, p. 186). However, in June 1957, it was reported that "Two years from now, when production goes into full swing, the Lan-chou refinery will process 1 million tons of crude oil annually" (Chinese International Service, Peking, June 28, 1957). Hence, it would appear that no more than 2 million tons were added to capacity in 1950–59.

TABLE 2.—CHINA: NATURAL GAS PRODUCTION

[In billions of cubic meters]

	Total	Szechwan	Other
1957		0.6	
1962		10.2	
1963		(11.93)	
1964		(13.96)	
1965		(16.34)	
1972		49.01	
1973	(55.76)	(50.61)	(5.15)
1974	58.15–64.07	52.28	5.87–11.79

SOURCES AND DERIVATION

Szechwan:

1957: "Ti-li Chih-shih," 10, 1958, p. 458. NCNA, Peking Oct. 25, 1957, gives daily output at 1,800,000 m^3 (657,000,000 m^3 on an annual basis); I assume this to be the rate as of the end of the 3d quarter and use 600,000,000 m^3 for the year.

1962: NCNA, Ch'eng-tu, Oct. 7, 1963, in SCMP, 3078, p. 18, reported output in Szechwan as 17 times that of 1957.

1963–65: Estimated to grow at 17 percent annually, the average rate reported for 1965–72.

1972: NCNA, Ch'eng-tu, Sept. 16, 1973, reported that output in 1972 was 3 times that of 1965.

1973: Estimated to grow by 3.3 percent, the average rate for 1972–74.

1974: JMJP, Jan. 15, 1975, p. 3, reported that output (in 1974) was 3.2 times that of 1965.

Other:

The estimating procedure for 1974 is somewhat convoluted; it should, however, give a minimal reasonable production figure for production outside Szechwan.

National production of natural gas grew by "nearly" 15 percent in 1974 (FBIS, Jan. 3, 1975, E-10). If we assume that all of China's natural gas in 1973 was produced in Szechwan, then national output in 1974 would be at least 58.15 bcm (50.61 bcm growing by 14.9 percent—"nearly" 15 percent). Since we have an output figure for Szechwan in 1974, we can subtract it from estimated national output to obtain production outside Szechwan. This gives a figure of 5.87 bcm—a minimal figure, since we assumed no production outside Szechwan in 1973.

To derive a more reasonable figure, we proceed as follows: National output in 1974 was reported as more than 3 times that of 1965 (FBIS, Jan. 3, 1975, E-10). Arbitrarily assuming this to be 3.3 times, the average annual rate of growth for 1965–74 was approximately 14 percent or roughly the same rate of growth as in Szechwan. If growth (outside Szechwan) was 14 percent in 1974, then output (outside Szechwan in 1973 was 5.15 bcm (5.87 bcm divided by 1.14). Adding 5.15 bcm to the 50.61 bcm produced in Szechwan gives us a national total of 55.76 bcm for 1973.

Since national output grew by 14.9 percent ("nearly" 15 percent) in 1974, output in 1974 would be 64.07 bcm. From this figure, we arrive at a figure of 11.79 bcm for areas outside Szechwan. This appears to be a more reasonable figure than the 5.87 bcm which assumes no production outside Szechwan in 1973. Actual output outside Szechwan in 1974 may lie between 5.87 bcm and 11.79 bcm, making national output between 58.15 bcm and 64.07 bcm.

These estimates raise several questions. They imply that Szechwan produced, from natural gas alone, 15.2 percent of the primary energy produced in all of China. None of this is shipped outside the province. Szechwan industry produces only 5 percent of the national industrial output; its population, on the other hand, accounts for about 11 percent of the national total. Since Szechwan also produces some coal and hydroelectric power, and a small quantity of oil, by implication a considerable portion of the gas "produced" is lost through leakages during transportation. The share of natural gas of primary energy consumed, versus produced, probably is much smaller.

TABLE 3.—CHINA: MAJOR REFINERIES

Refinery	Annual capacity (million metric tons)	Date reported
Ta-ch'ing	5.0	1974
Dairen	5.0	1973
Fu-shun No. 2	4.3	1974
Shanghai	4.0	1974
Peking	3.5	1973
Sheng-li	3.5	1974
An-shan	2.5	1973
Mao-ming	2.5	1974
Fu-shun No. 1	2.0	1974
Ta-kang	.6	1974
Tu-shan-tzu	[1] 1.0	
Lan-chou	[1] 2.0	
Nanking	[1] 3.0	
Yu-men	[1] 1.0	
Nan-ch'ung	[1] .3	

[1] Author's guess.

CHINA'S IRON AND STEEL INDUSTRY

By ALFRED H. USACK, JR., *and* JAMES D. EGAN

CONTENTS

I. SUMMARY AND CONCLUSIONS

In its first 25 years, the People's Republic of China has made rapid progress in developing the key iron and steel industry. With the help of the Soviet Union, a number of large iron and steel bases were developed in the 1950's. Since then, advances have been made on the basis of China's own efforts and selective help from non-Communist countries. Some new technology has been introduced—particularly the basic oxygen furnace which has increased production efficiency—and the quality and variety of steel products have improved. Annual production of crude steel is now in the neighborhood of 25 million metric tons, making China the sixth largest producer in the world.

China has the potential for a much larger iron and steel industry. Three factors have been holding back development:

China's domestic resources of iron ore and coal, although plentiful, are of a low quality and must be given special treatment. Beneficiation technology, now in use in foreign countries, will enable the PRC to treat native materials and to ultimately operate a large steel industry entirely on its own resources. However, China has been very slow to invest in beneficiation. This has seriously retarded iron production capabilities.

The Chinese had not yet trained a fully competent work force when the Soviet technicians were withdrawn in 1960. They still lack the organizational and technical expertise to provide a balanced structure to the industry and to develop new techniques on their own. Technical assistance has been provided by Western countries and Japan but the unwillingness of the Chinese to accept large numbers of foreign technicians has reduced its effectiveness.

Capital shortages in the general economy have led to imbalance in the iron and steel industry. For example, the mining sector has been allocated a minimum of capital forcing it to operate in a labor-intensive fashion. That was adequate while the industry was small but the industry has grown until the demand for ore cannot be met without an infusion of capital. In fact, substantial amounts of iron ore and pig iron have been imported in recent years to meet demand. Finishing facilities also have not kept pace with crude steel output, and a large tonnage of finished products must be imported.

The Chinese are moving to correct these deficiencies, mostly through imports of modern capital equipment. Mining and ore beneficiating equipment and a large steel finishing facility have been purchased in the last few years.

Installation of this equipment will take several years, and demand for steel products will meanwhile continue to rise. Therefore, the present imbalances probably will persist through the 1970's, with output rising at only a moderate rate. Beyond 1980, progress in the industry will depend on how rapidly the PRC improves its own capability to produce the needed machinery and equipment and how willing it is to devote large amounts of foreign exchange to pay for steelmaking equipment and technology.

II. Introduction

Although the Japanese and West Europeans had built iron and steel plants in China, most of these were damaged or destroyed by the time of the Communist takeover in 1949. More important, the facilities had been built and managed by outsiders, so the Chinese had practically no experience when they undertook the task of building an integrated iron and steel industry. The USSR provided a lot of help in the 1950's but the premature withdrawal of Soviet technicians in mid-1960 set the Chinese back a number of years. Since 1960, Mao's great political and social campaigns have continued to interfere with development of the industry.

Analysis of the industry is complicated by a dearth of information, especially since 1960. We are particularly short of solid information on the extent of resources and their development. Before 1958, Peking released statistics on most economic sectors in various publications but nowhere provided a comprehensive set of statistics or precise definitions of the statistics presented. The exaggerated statistics of the Leap Forward era (1958–60) help to confuse the picture. Output during this period, especially the product of the small plants, simply is not comparable in quality to output before or after. The Chinese continue to refer to the production statistics reported in the 1950's, and any attempt to reconstruct Chinese series must take these figures into account. Practically no statistical information on the economy, including the iron and steel industry, was released in the 1960's. Since 1970, the Chinese have announced a few national statistics for steel which have helped to clarify general trends in the industry.

This paper describes the development in the industry since 1959 and provides a number of statistical series. It also discusses problems the Chinese have in expanding and modernizing the industry and the alternatives available for solving these problems.

Because raw material problems are particularly significant, we have devoted the first section to their discussion. After a historical section, we then discuss the main components of steel production and the problems of balanced growth. Comments on prospects for the next few years complete the main text. An appendix describes the principal iron and steel plants in China.

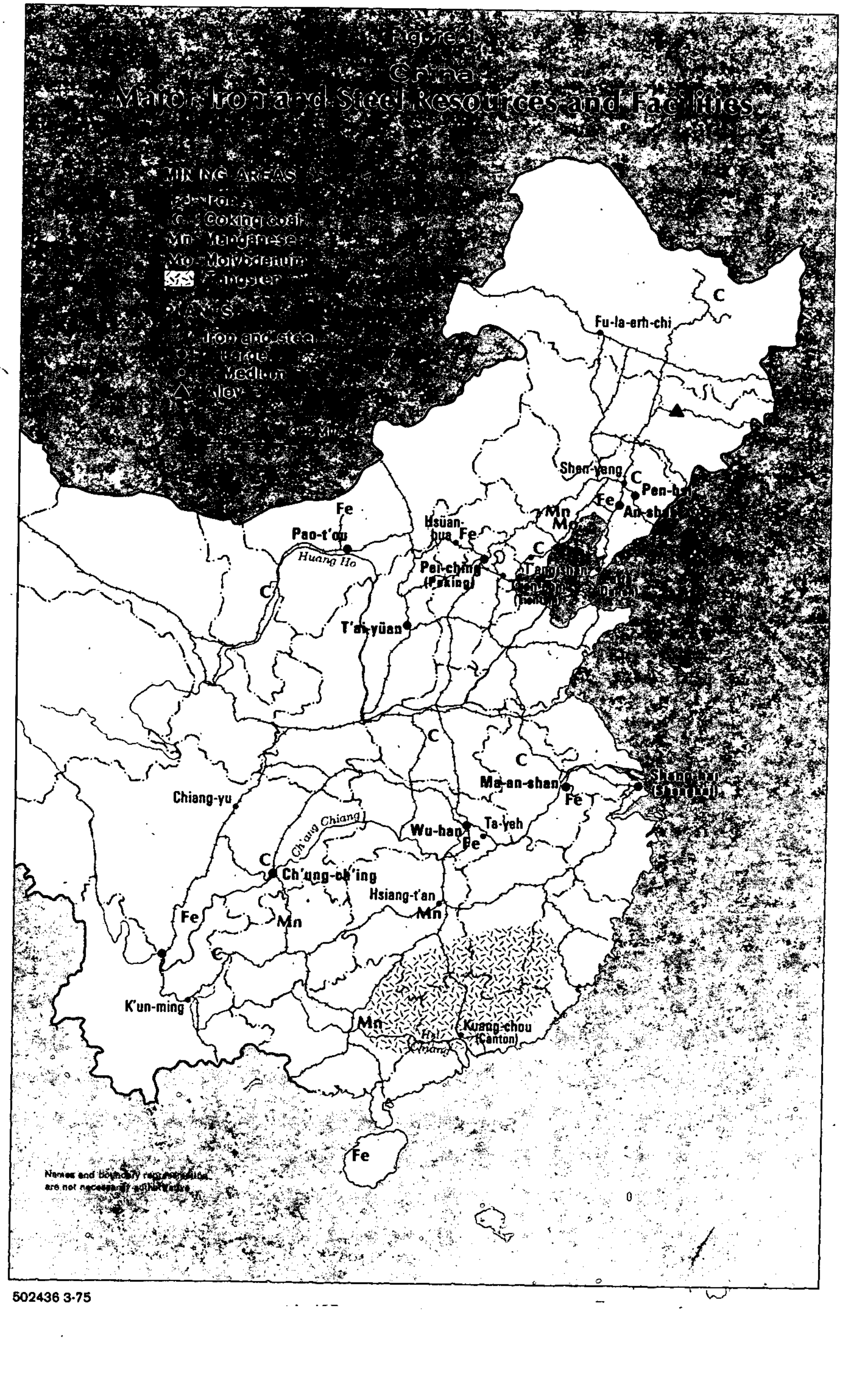
Abbreviations used in the footnotes in this paper are:

Abbreviation	*Reference*
BBC, SWB	*British Broadcasting Corporation, Summary of World Broadcasts*, Part 3, The Far East, Weekly Economic Report, Reading, England.
CMP–SCMP	*China Mainland Press—Survey of China Mainland Press*, Hong Kong, USS Consulate General.
FBIS	*Foreign Broadcast Information Service*, Washington, D.C.
FBIS I	*Foreign Broadcast Information Service, Volume I, People's Republic of China.*
JPRS	*Joint Publications Research Service*, Washington, D.C.
NCNA	*New China News Agency*, Peking, and other cities.
SCMP	*Survey of China Mainland Press*, Hong Kong, U.S. Consulate General.

III. Raw Materials Base

The People's Republic of China has large resources of the basic raw materials needed to become one of the world's largest steel producers. Coal, iron ore, and limestone are found in widespread areas—the only deficit area being southeast China. Large deposits of important alloying materials—manganese, molybdenum, vanadium, and tungsten—also are available (see figure 1 for the distribution of major resources).

Resource weaknesses include the inferior quality of much of the coal and iron ore and the dependence on imports for a large part of requirements for cobalt, chromium, nickel, and steel scrap. Organizational and technological weaknesses have exacerbated China's resource problems. In the 1950's, in their haste to increase production rapidly, the Chinese failed to survey potential resources fully and major plants were built in areas where resources were scarce. For example, the large plant at Pao-t'ou was built at a location far away from suitable supplies of coal. Inefficient organization and management led to waste of resources and capital. Some sectors of the industry grew slower than others, causing severe bottlenecks. Ore beneficiation in particular was neglected despite the poor grade of Chinese ores. Shortages of iron ore held back production of pig iron and the poor quality affected efficiency of operations. And, delays in completion of steel finishing facilities postponed full utilization of steel production capacity.


China
Major Iron and Steel Resources and Facilities
Coking coal
Manganese
Molybdenum
Medium
C
Fu-la-erh-chi
Shen-yang
Pen-hsi
Fe
Mn
Mo
Pao-t'ou
Hsüan-hua
Huang Ho
Pei-ching
(Peking)
T'ai-yüan
Ma-an-shan
Chiang-yu
Ch'ang Chiang
Wu-han
Ta-yeh
Ch'ung-ch'ing
Hsiang-t'an
K'un-ming
Kuang-chou
(Canton)
Names and boundary representation are not necessarily authoritative

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Iron Ore

The PRC has large deposits of low-grade iron ore and a few small deposits of high-grade ore. No precise quantification of these deposits, based on an objective up-to-date survey, is available. Published figures range from the pre-1949 estimate of 2 billion tons to the fantastic claim of 100 billion tons made by the Chinese during the Great Leap Forward. In any event, reserves are sufficient for continued exploitation well into the 21st century.

Nearly all the major iron mining areas are located north of the Yang-tse. Deposits now being worked include those surrounding the An-shan Iron and Steel Plant in Liaoning, the mines northwest of Peking, the mines in the Pai-yun-o-po area north of Pao-t'ou, and the mines near Ta-yeh and Ma-an-shan in the Yang-tse valley. Numerous other iron ore deposits exist; the potential output from ore bodies in Kansu, Kweichow, southern Szechwan, and Kwangtung is especially great. Vast areas in China's hinterland have not been surveyed for mineral resources of any type. Even if rich iron discoveries were made in the near future, several years and generous doses of capital would be needed before the industry would benefit.

Since 1952, the average grade of China's domestically mined iron ore has generally fallen. The industry has had to turn increasingly to deposits of low grade ore in order to increase production. During years of normal growth, Peking has emphasized exploitation of high-grade ore deposits and the average iron content has usually run over 40 percent. This appears to have been the case during the rehabilitation period of the early fifties and the retrenchment period of the early sixties. In times of rapid expansion—for example, the Leap Forward (1958–60) and the early 1970's—the average grade falls well below 40 percent iron content. Table 1 provides details.

TABLE 1.—CHINA: PRODUCTION OF IRON ORE, 1949–74

Year	Iron ore production (million tons)			Standard iron ore (55 percent) requirements (million tons)			Average grade of ore mined [7] (percent)
	Total [1]	Large mines [2]	Small mines [3]	For pig iron [4]	Net exports [5]	Total [6]	
1949	0.589	0.584	0.005	0.504		0.504	47.1
1950	2.350			1.956	0.20	2.156	50.5
1951	2.703			2.296	.15	2.446	49.8
1952	4.287			3.858	.36	4.218	54.1
1953	5.821			4.468	.44	4.908	46.4
1954	7.229			6.228	.50	6.728	51.2
1955	9.597	7.614	1.983	7.744	.72	8.464	48.5
1956	15.484	12.887	2.597	9.652	.81	10.462	37.2
1957	17.67	14.14	3.53	11.872	.39	12.262	38.2
1958	59.0	26.9	32.1	27.38	−.10	27.28	25.4
1959	83.0	43.0	40.0	41.0	−.01	40.99	27.2
1960	100.0	57.0	43.0	55.0	−.08	54.92	30.2
1961				17.6	−.33	17.27	
1962				17.6	.03	17.63	
1963				19.8	.04	19.84	
1964				23.8	.04	23.84	
1965	38.3			27.6	.22	27.82	40.0
1966				33.2	.32	33.52	
1967				26.4	.25	26.65	
1968				30.8	.07	30.87	
1969	48.8	42.5	6.3	35.2	.02	35.22	39.7
1970	72.3	54.2	18.1	44.0	−.03	43.97	33.4
1971	91.1	65.8	25.3	54.2	.03	54.17	32.7
1972	103.4			60.8			
1973	107.2			67.4			
1974	99.9			62.8			

[1] Information was derived as follows:

1949–56—State Statistical Bureau, People's Republic of China, "Major Aspects of the Chinese Economy Through 1956," Peking, pp. 14, 26 (translation).

1957–58—Calculated from increases of 30 and 100 times over 1949 as reported in JPRS 3754, Aug. 25, 1960, p. 3.

1959—State Dispatch, Hong Kong, No. 272, Nov. 27, 1959.

1960—Based on 10-mo. figure reported in FBIS, Dec. 15, 1960, p. BBB5 (NCNA, Peking, Dec. 13, 1960).

1965—Calculated from assumed average grade of ore (above 1956–57 but well below 1949–55).

1969—Based on 48 percent increase 1970 over 1969 reported in BBCSWB FE/W638/A/1, Sept. 8, 1971.

1970—Increase of 26.1 percent for 1971 over 1970 (FBIS 1, Jan. 3, 1972, p. B10—NCNA, Peking, Dec. 31, 1971).

1971—Based on 1st quarter report that production in 1972 increased by 13.5 percent over 1971 (FBIS 1, May 2, 1972, p. B11—NCNA, Peking, May 1, 1971). This figure seemed reasonable in light of increase in pig iron production of 12 percent for 1972.

1972—Production was 2.7 times as great as 1965 (CMP-SCMP-73-38, Sept. 1973—NCNA, Peking, Sept. 6, 1973).

1973—Production was 2.8 times as great as 1965 ("Peking Review", Jan. 11, 1974, p. 21).

1974—Estimated that production declined by the same percentage as pig iron production.

[2] Information for production from large mines was derived as follows:

1949, 1955–56—It was assumed that production figures reported in Yen-Chin Pao, Peking, Oct. 10, 1957, pp. 6–8 were for large plants only.

1957—Estimated that large plants accounted for 80 percent of total production, about the same as that for 1955–56.

1958—Production at large plants increased by 90 percent (SCMP No. 1949, Feb. 5, 1959, p. 8—NCNA, Peking, Jan. 30, 1959).

1959, 1969–71—Residual.

1960—Production at large mines increased by ⅓ in 1st 10 mo (FBIS, Dec. 15, 1960, p. BBB5—NCNA, Peking, Dec. 13, 1960).

[3] Information for small plants was derived as follows:

1949, 1955–58, 1960—Residual.

1959—Chou En-lai reported that small mines produced 20,000,000 tons of ore in the 1st half of 1959 (SCMP No. 2100, Sept. 22, 1959, p. 17).

1969—Output was 4 times as great in 1971 as in 1969 (FBIS 1, Sept. 29, 1972, p. B10—NCNA, Peking, Sept. 28, 1972).

1970—Local mines produced ¼ of the nations total output (FBIS 1, Sept. 28, 1971, pp. B2–4—NCNA, Sept. 27, 1971).

1971—Output was 40 percent above 1970 (FBIS 1, Jan. 3, 1972, p. B10—NCNA, Peking, Dec. 31, 1971).

[4] Approximately 2 tons of standard grade (55 percent iron content) ore are required to produce 1 ton of pig iron (1.82 plus about 10 percent for loss).

[5] See table 6.

[6] The sum of cols. 4 and 5. It is assumed that ore exported and imported is at standard grade.

[7] Except for 1965 where the figure is assumed, the grade is calculated by dividing total requirements of 55 percent standard ore by actual production and multiplying by 0.55.

Coking Coal

No information is available on the size of China's resources of coking coal. Huge deposits of bituminous coal consist mainly of gas coal and weak coking coal. Only small amounts of good quality coking coal are available.[1]

China's coking coal resources lie mainly in North and Northeast China. Three of the major coking coal centers in the country—Fushun, Hao-kang, and Kai-luan—were developed before 1949. Newly expanded mines that produce sizable quantities of coking coal include the Huai-nan Mine in Anhwei and the Ping-ting-shan Mine in Honan. Some coking coal is produced in Southwest China near Chungking and in eastern Yunnan and western Kweichow. The Shih-tsui-shan mine in Ninghsia Autonomous Region is the major coking coal center in Northwest China. Only small amounts of coking coal are available in the coal-rich provinces of Shansi and Shensi. All types of coal are in short supply in Southeast China.

According to a Soviet study of 1959, only 2.6 percent of the explored coking coal seams produced coal that could be readily beneficiated, and coal from 81.6 percent of the seams was difficult or very difficult to beneficiate. The ash content of 80 percent of the seams was above 15 percent. The sulfur content of 50 percent of the seams was above 1 percent. Ordinarily sulfur content should be 1¼ percent or less and ash content 8 percent or less for a good coking coal. Three-fourths of the coal used for coking in 1958 consisted of gas coal or weak coking coal.[2]

China has claimed significant breakthroughs in the use of anthracite and local coals in the production of steel. For example, the Pao-t'ou Steel Plant got its coal from as far as 1,000 miles away until means of using local coals (both bituminous and anthracite) were developed. Among the processes to reduce gas content and increase the mechanical strength of coke are selective processing, blending, the introduction of additives, and rapid preheating. In some cases, the portion of coking coal is said to have been reduced to 20 percent. The use of mixed types of coal for coking, it is claimed, has doubled China's coal resources for making coke.[3] Despite these claims, China has been unwilling or unable to export coking coal to Japan in recent years. The continued launching of campaigns to substitute local coal for coking coal in the chemical and steel industries also indicate that severe shortages of coking coal still exist.

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[1] See JPRS 5642, Oct. 13, 1960, pp. 28–62 for a description of the quality of China's coal (article by Wang Yin-jen).

[2] JPRS: 14, 738, Aug. 6, 1962, *The Coal Industry of the People's Republic of China*, pp. 94–100.

[3] See JPRS: 32.205, Sept. 20, 1965, pp. 10–11, JPRS: 29.968, May 7, 1965, pp. 9–13, JPRS: 31,340, July 30, 1965, pp. 14–15 and JPRS: 33,283, Dec. 13, 1965.

TABLE 2.—CHINA: ESTIMATED REQUIREMENTS FOR COAL AND COKE BY IRON AND STEEL INDUSTRY, 1949-74

Year	Requirements by modern plants					Requirements by local plants					Other raw coal needs (million tons) [10]	Total coke requirements (million tons) [11]	Total raw coal requirements (million tons) [12] [13]
	Pig iron production (million tons) [1]	Coke/ton pig iron (tons) [2]	Coke (million tons) [3]	Standard coal (million tons) [4]	Raw coal (million tons) [5]	Pig iron production (million tons) [1]	Coke/ton pig iron (tons) [6]	Coke (million tons) [7]	Standard coal (million tons) [8]	Raw coal (million tons) [9]			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1949	0.231	1.0	0.231	0.35	0.69	0.021	1.0	0.02	0.03	0.10	0.05	0.3	0.8
1950	.928	1.0	.928	1.39	2.78	.050	1.0	.05	.08	.22	.17	1.0	3.2
1951	1.056	1.0	1.056	1.58	3.17	.092	1.0	.09	.14	.41	.26	1.1	3.8
1952	1.812	1.0	1.812	2.72	5.44	.117	1.0	.12	.18	.53	.40	1.9	6.4
1953	2.098	.941	1.974	2.96	5.92	.136	1.0	.14	.20	.61	.54	2.1	7.1
1954	2.940	.893	2.625	3.94	7.88	.174	1.0	.17	.26	.78	.64	2.8	9.3
1955	3.688	.804	2.965	4.45	8.90	.184	1.0	.18	.28	.83	.83	3.1	10.6
1956	4.674	.791	3.697	5.55	11.09	.152	1.0	.15	.23	.68	1.28	3.8	13.1
1957	5.786	.75	4.340	6.51	13.02	.150	1.0	.15	.22	.68	1.50	4.5	15.2
1958	9.53	.75	7.15	10.72	21.44	4.16	1.0	4.16	6.24	20.80	3.79	11.3	46.0
1959	9.50	.75	7.12	10.69	21.38	11.00	1.0	11.00	16.50	52.14	4.83	18.1	78.3
1960	13.75	.75	10.31	15.47	30.94	13.75	1.0	13.75	20.62	61.88	6.82	24.1	99.6
1961	8	.75	6.0	9.0	18.0	.8	1.0	.8	1.2	3.6	2.4	6.8	24.0
1962	8	.74	5.9	8.9	17.8	.8	1.0	.8	1.2	3.6	2.4	6.7	23.8
1963	9	.73	6.6	9.9	19.7	.9	1.0	.9	1.4	4.0	2.7	7.5	26.5
1964	11	.72	7.9	11.8	23.6	.9	1.0	.9	1.4	4.0	3.2	8.8	30.8
1965	12.6	.71	8.9	13.4	26.8	1.2	1.0	1.2	1.8	5.4	3.8	10.1	36.0
1966	15.4	.70	10.8	16.2	32.4	1.2	1.0	1.2	1.8	5.4	4.5	12.0	42.3
1967	12	.70	8.4	12.6	25.2	1.2	1.0	1.2	1.8	5.4	3.6	9.6	34.2
1968	14	.70	9.8	14.7	29.4	1.4	1.0	1.4	2.1	6.3	4.2	11.2	39.9
1969	16.2	.69	11.2	16.8	33.5	1.4	1.0	1.4	2.1	6.3	4.8	12.6	44.6
1970	18.1	.68	12.3	18.5	36.9	3.9	1.0	3.9	5.8	17.6	5.3	16.2	59.8
1971	20.2	.67	13.5	20.3	40.6	6.9	.95	6.6	9.8	29.5	6.3	20.1	76.4
1972	22.2	.66	14.7	22.0	44.0	8.2	.95	7.8	11.7	35.1	6.9	22.4	85.9
1973	24.1	.65	15.7	23.5	47.0	9.6	.9	8.6	13.0	38.9	7.6	24.3	93.5
1974	22.5	.65	14.6	21.9	43.9	8.9	.9	8.0	12.0	36.0	7.1	22.6	87.0

[1] See table 4. Figures for 1957, 1961–64, and 1966–68 are rough estimates.

[2] Data for 1952–56 are from Wu (footnote 4 in text), and the remainder of the data are estimates based on a variety of information available for individual plants.

[3] Col. a times col. b. Derived from unrounded data.

[4] Col. c times 1.5, the approximate amount of standard coal needed to produce 1 ton of coke in the USSR and other countries. Derived from unrounded data.

[5] Col. d times 2. Based on amounts of raw coal to produce a ton of coke concentrate in China during 1952–57 (Joint Publications Research Service, JPRS: 14, 738, August 14, 1962, p. 96—translation of Ugol'naya Promy shlenmost' Kitayskov Respubliki by I. I. Bazhenov, I. A. Leonenko, and A. K. Kharchenko, Moscow, 1959, pp. 378–383). The figures varied from 1.81 to 2.14. Coke concentrate is assumed to be approximately equivalent in heating value to standard coal (7,000 kilocalories per kilogram based on factor of more than 0.9 standard tons of coal per ton of concentrate in the USSR.)

[6] Estimate. Figures probably considerably higher than those for modern plants except possibly in early period.

[7] Col. f times col. g. Derived from unrounded data.

[8] Col. h times 1.5 (see note 4 above). Derived from unrounded data.

[9] Col. i times 3 except in 1958 and 1959; it is estimated that about 1½ times as much coal is required per ton of standard coal as for modern plants because most of the coal that is mined locally is of poorer grade and larger quantities of waste materials must be removed. For 1958 the figure of 5 tons of raw coal per ton of pig iron was cited by Wu (footnote 4 in text) on p. 257. Therefore, 3.33 tons of raw coal were needed for each ton of standard coal. The 1959 figure is an extrapolation between 1958 and 1960 or 3.16.

[10] Data for 1949–60 are from Wu (footnote 4 in text) pp. 112–113. Figures for 1961–73 are derived by multiplying crude steel production (table 5) by 0.3, the approximate average requirements according to Wu.

[11] Sum of cols. c and h. Rounded to nearest 100,000.

[12] Sum of cols. e, j, and k. Rounded to nearest 100,000.

[13] Some products of washing such as midlings, fines, etc. are unsuitable for coke but can be used as a source of fuel. Thus part of the coal shown in column m is not really consumed by the steel industry.

Use of poor grades of coking coal results in large losses in beneficiation—about 50 percent of the coal is lost in the beneficiation process. The losses are even higher when local coals are used in small iron and steel plants. In 1958, for example, it was reported that five tons of coal were required to produce one ton of pig iron in local plants.[4] As a result of these large losses, huge quantities of raw coal are required by China's steel industry (see table 2). In 1974, for example, the nearly 90 million tons of coal used in steel production represented 23 percent of China's total coal output. Since this coal includes some of the highest quality coal produced in China, it comprises an even larger portion of total output in terms of heat value.

Estimates of the amount of coke used in steelmaking also are shown in table 2. Sizable quantities of coke are used in other metallurgical sectors and in the chemical industry, especially for the production of fertilizer. In addition, small amounts of coke are exported.

Scrap

The scarcity of iron and steel scrap has forced the Chinese to use a relatively small proportion of scrap for each ton of steel produced. Scrap consumption ordinarily amounts to about 45 percent of China's crude steel output compared with 50 percent to 55 percent in the United States.

About one-fourth of China's crude steel production gets trimmed off and recycled as scrap during the finishing process. The PRC steel industry needs nearly twice as much scrap as is generated by intra-industry recycling (see table 3).

To help alleviate the scrap shortage the PRC has carried on a metal collection campaign among the populace. The campaign has been pursued almost continuously since 1952; in 1974 five million tons were collected. However, the domestic scrap potential is small because China has not had a long span of industrialization in which to build up backlogs of aged and discarded metal goods. This problem is compounded by the shortage of both consumer and capital equipment in China, which leads to long extensions of service life. As a result, the PRC has turned to imports for part of its scrap needs.

[4] *Mei-t'an Kung-yeh*, No. 22, pp. 3–4, November 1958, cited in Wu, Yuan-li, *Economic Development and the Use of Energy Resources in Communist China*, 1963, p. 257.

TABLE 3.—CHINA: SCRAP STEEL, 1949–74

[In millions of tons]

Year	Generated in finishing [1]	Collected [2]	Total domestic [3]	Imports [4]	Total consumed [5]
1949	0.035	--	--	--	--
1950	.25	--	0.2	--	0.2
1951	.21	--	.2	--	.2
1952	.24	0.2	.4	--	.4
1953	.28	.4	.7	--	.7
1954	.46	.6	1.1	--	1.1
1955	.63	.8	1.4	--	1.4
1956	1.24	1.0	2.2	--	2.2
1957	1.06	1.2	2.3	--	2.3
1958	2.03	1.4	3.4	--	3.4
1959	2.7	1.6	4.3	--	4.3
1960	4.0	1.8	5.8	--	5.8
1961	2	2.0	4.0	--	4.0
1962	2	2.2	4.2	--	4.2
1963	2.2	2.4	4.6	--	4.6
1964	2.7	2.6	5.3	--	5.3
1965	3.1	2.8	5.9	0	5.9
1966	3.8	3.0	6.8	.030	6.8
1967	3	3.2	6.2	.340	6.5
1968	3.5	3.4	6.9	.070	7.0
1969	4	3.6	7.6	.130	7.7
1970	4.4	3.8	8.2	.140	8.3
1971	5.6	4.0	9.6	.340	9.9
1972	6.1	3.9	10.0	.373	10.4
1973	6.4	4.6	11.0	.640	11.6
1974	6.0	4.8	10.8	.300	11.1

[1] Crude steel production (table 5) minus finished steel production (table 7). The figures for 1958–60 are based on the estimated amount of crude steel processed (8,130,000 tons in 1958, 10,800,000 tons in 1959 and 15,300,000 tons in 1960). The remainder of crude steel produced probably was of such poor quality that it could not be converted into finished products. Small amounts of this poor quality steel may also have been turned to scrap though much of it was unuseable even for scrap purposes.

[2] The figures for 1972 and 1973 are total scrap generated minus scrap generated in finishing. A linear increase of 200,000 tons per year is estimated for the remaining years.

[3] The figures for 1972 and 1973 were reported in NCNA on Dec. 27, 1972 and Feb. 1, 1974, respectively. The remaining figures are the sum of scrap generated in finishing and old scrap collected.

[4] Import figures are derived from statistical releases of trading partners.

[5] Total scrap consumed equals total scrap generated plus imports. Scrap is assumed to have been consumed in the year obtained.

IV. Development of the Steel Industry

Soviet Influence

The steel industry the Communists inherited in 1949 was in disarray. From a high of 1,800,000 tons of pig iron and 900,000 tons of steel in 1943, production had slipped to 250,000 tons of pig iron and 160,000 tons of steel in 1949. Most of the major plants were idle. The Soviets had taken away much of the machinery from mills in the Northeast after WWII, and many other plants had been gutted during the civil strife.

Immediately after the Communist takeover, the PRC began to rebuild its steel industry with the help of the U.S.S.R. Major reconstruction was scheduled at the following facilities during the First Five-Year Plan (1953–57):

Lai-Pin Manganese Mine in Kwangsi.
An-shan Iron and Steel Company.

T'ang-shan Refractory Materials Plant.
Pen-ch'i Iron and Steel Co.'s Kuang-yuan Plant.
Ta-yeh Special Steel Works.
T'ai-yuan Iron and Steel Works.
Lung-yen Iron Mine.
Ma-an-shan Iron Mine.
Southwest Plant No. 101 (includes Tsun-i Manganese Mine).
Southwest Plant No. 102.

Major new construction projects included in the Plan were:
Wu-han Iron and Steel Co.
Fu-la-erh-chi Special Steel Plant.
Kirin Ferrous Alloy Plant.
Pao-t'ou Iron and Steel Co.
Jehol Vanadium-Titanium Plant.[5]

By 1952, production already had surpassed pre-Communist highs. In 1957, output of pig iron was three times and output of steel was four times output in 1952. Tables 4 and 5 present production of pig iron and crude steel, 1949–74.

In addition to large increases in production: (a) productivity was increased and input norms were reduced through improvements in technology, (b) a wider variety of products was produced, and (c) management was improved. The Soviet technicians were particularly helpful in imparting their experience and in training the Chinese to operate and manage the plants.

The Leap Forward

Despite the marked progress in steel and other industrial branches, Chairman Mao felt that growth could be even more rapid, and in 1958 he launched the "Great Leap Forward". Small iron and steel plants called "backyard furnaces" were built by the hundreds of thousands, giving rise to exaggerated claims of huge increases in iron and steel production. By late 1958 it became apparent that these plants were using large amounts of valuable raw materials and labor to produce a nearly useless product. By the end of 1959 most of these plants had been closed down and their production was no longer included in state plans.

At the same time, small modern plants were introduced. Thousands of these plants were built, and at their peak in 1959–60, they accounted for as much as one-half of China's pig iron and a third of its steel.[6] Though the the product from these plants was much higher in quality than the output from the backyard furnaces, the quality still was not good enough for many purposes. The main problem was the high content of impurities, especially sulfur caused mainly by the quality of the coal and ore used. Additional problems were related to the high cost of inputs, the shortages of skilled labor, and the huge transport costs.

In the meantime, the large modern sector of the industry continued to expand. Installation of new equipment was speeded up and attempts were made to speed up production by using equipment around the

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[5] State Statistical Bureau, People's Republic of China, *Major Aspects of the Chinese Economy Through 1956*, Peking, p. 18 (translation).

[6] For a fuller discussion of small plant programs see: Clark, M. Gardner, *The Development of China's Steel Industry and Soviet Technical Aid*, Ithaca, New York, 1973; CIA A (ER) 74-60, *China: Role of Small Plants in Economic Development*, May 1974.

clock with practically no shutdowns for maintenance and repair. This, together with the introduction of poor grades of iron in the modern steel plants, caused a reduction in quality of output and damage to equipment. Nevertheless, useful production from these plants did increase considerably, though not as much as the government announced. The claimed increase in steel production from modern plants was more than doubled from 5.35 million tons in 1957 to 12.75 million tons in 1960.

TABLE 4.—CHINA: PRODUCTION OF PIG IRON, 1949-74

Year	Total [1]	Production: Large plants [2]	Production: Medium and small plants [3]
1949	0.252	0.231	0.021
1950	.978	.928	.050
1951	1.148	1.056	.092
1952	1.929	1.812	.117
1953	2.234	2.098	.136
1954	3.114	2.940	.174
1955	3.872	3.688	.184
1956	4.826	4.674	.152
1957	5.936	NA	NA
1958	13.69	9.53	4.16
1959	20.50	9.45	11.05
1960	27.50	13.75	13.75
1961	8.8	NA	NA
1962	8.8	NA	NA
1963	9.9	NA	NA
1964	11.9	NA	NA
1965	13.8	12.6	1.2
1966	16.6	NA	NA
1967	13.2	NA	NA
1968	15.4	NA	NA
1969	17.6	16.2	1.4
1970	22.0	18.1	3.9
1971	27.1	20.2	6.9
1972	30.4	22.2	8.2
1973	33.7	24.1	9.6
1974	31.4	22.5	8.9

[1] Total production of pig iron by year was derived as follows:
1949-50, 1952-58—"Ten Great Years," Foreign Language Press, Peking, p. 95.
1951—State Statistical Bureau, People's Republic of China, "Major Aspects of the Chinese Economy Through 1956," Peking, p. 14 (translation).
1959—Reported in FBIS, Jan. 22, 1960, p. BBB3 (NCNA, Peking, Jan. 22, 1960).
1960—Plan figure reported in FBIS, Mar. 31, 1960, p. BBB16 (NCNA, Peking, Mar. 30, 1960).
1961-65, 1967-69—Calculated on the basis of pig iron production is equal to 1.1 times steel output (figure derived from 1957 and 1960 large plant relationships as most of small plants were closed down during this period).
1966—Pig iron production increased by 20 percent over 1965 (New York Times, Sept. 28, 1966, p. 5).
1970—Based on reported 23 percent increase in 1971 over 1970 (FBIS I, Jan. 3, 1972, p. B10—NCNA, Peking, Dec. 31, 1971).
1971—Based on reported 12 percent increase in 1972 over 1971 ("Peking Review," Jan. 12, 1973, p. 9).
1972—Production was 2.2 × 1965 (CMP-SCMP-73-38, September 1973—NCNA, Peking, Sept. 6, 1973).
1973-74—Estimated on basis of ratio of pig iron production to steel production in 1972 (1.32 times) as small and large plant proportions estimated to be the same as in 1972.

[2] Production from large plants is the difference between total production and that of small and medium plants.

[3] Estimates for small (locally administered) plants were derived as follows:
1949-56—State Statistical Bureau, People's Republic of China, "Major Aspects of the Chinese Economy Through 1956," Peking pp. 13, 43 (translation). Data are the sum of production from plants not operated by the State. Figures for 1949-51 were calculated by using the same ratio of production to value of output as in 1952.
1958—"Ten Great Years," Foreign Language Press, Peking, 1960, p. 95.
1959—FBIS, Jan. 22, 1960, p. BBB7 (NCNA, Peking, Jan. 22, 1960).
1960—Estimated that accounted for ½ of total or about the same as proportion in 1959.
1956—Production in 1972 rose 6 times over 1965 (CMP-SCMP-73-38, September 1973, p. 10—NCNA, Peking, Sept. 6, 1973).
1969—Production in 1971 was 5 times that of 1969 (FBIS I, Sept. 29, 1972, p. B10—NCNA, Peking, Sept. 28, 1972).
1970—Production in 1970 was 2.8 times that of 1969 (FBIS I, Dec. 17, 1970, p. B9—NCNA, Peking, Dec. 16, 1970)
1971—Production increased by 19 percent in 1972 ("Peking Review," Jan. 12, 1973, p. 20).
1972—Production was 27 percent of the national total ("Peking Review," Oct 5, 1973, p. 23).
1973—Production increased by 17 percent over 1972 ("Peking Review," Jan. 11, 1974, p. 21).
1974—Estimated that production declined by the same ratio as total production of pig iron.

TABLE 5.—CHINA: PRODUCTION OF CRUDE STEEL, 1949–74

Year	Production (million tons)		
	Total [1]	Large plants [2]	Medium and small plants [3]
1949	0.158		
1950	.606		
1951	.896		
1952	1.349		
1953	1.774		
1954	2.225		
1955	2.853		
1956	4.465		
1957	5.35		
1958	11.08	8.00	3.08
1959	13.35	8.63	4.72
1960	18.67	12.45	6.22
1961	8.0		
1962	8.0		
1963	9.0		
1964	10.8		
1965	12.5	12.0	.5
1966	15.0		
1967	12.0		
1968	14.0		
1969	16.0	15.5	.5
1970	17.8	16.1	1.7
1971	21.0	18.6	2.4
1972	23.0	20.2	2.8
1973	25.5	22.3	3.2
1974	23.8	20.8	3.0

[1] Total production of crude steel by year was derived as follows:

1949–58—"Ten Great Years," Foreign Language Press, Peking, 1960, p. 95.

1959—FBIS No. 15, Jan. 22, 1960, p. BBB3.

1960—CMP-SCMP-73-38, September 1973, p. 100 (NCNA, Peking, Sept. 6, 1973).

1961–62—Rough estimates based on known reductions at individual plants, closure of small plants, a slight rise in 1963, and little apparent change between 1961 and 1962.

1963—Mid-point of 8,000,000- to 10,000,000-ton range reported in Far Eastern Economic Review No. 7, vol. XLIII, Feb. 13, 1964, p. 341.

1964—Increase of 20 percent (SCMP No. 3385, Jan. 26, 1965, p. 22—NCNA, Peking, Jan. 21, 1965).

1965—Output in 1973 was reported to be more than double that of 1965 (Peking Review, No. 2, Jan. 11, 1974, p. 21); thus figure was no higher than 12.75. A number of secondary sources gave a figure of 12. Our estimate of 12.5 falls between the 2 giving an increase of 16 percent for 1965 over 1964 (industrial output increased by 20 percent) and keeping 1966 output at a reasonable level.

1966—Production increased by more than 20 percent in the 1st 8 mo (FBIS 66 W10277—NCNA, Peking, Sept. 26, 1966).

1967—Japanese estimate reported in American Metal Market, July 25, 1968, p. 6.

1968—Interpolation, 1967 and 1969.

1969—Figure reported in Metal Bulletin, Mar. 5, 1971, p. 30.

1970—Based on official statement that 1971 production of 21,000,000 tons was 18 percent above 1970 production (FBIS I, Jan. 3, 1972, p. B10).

1971—Same source as for 1970, above.

1972—Figure reported in CMP-SCMP-73-38, September 1973, p. 100 (NCNA, Peking, Sept. 6, 1973).

1973—Estimates vary usually between 25,000,000 and 26,000,000 tons. We use the mid-point between Japanese report of 26,000,000 tons reported in Metal Bulletin, Jan. 24, 1974, and 25,000,000 tons reported in "China Trade Report", August 1974. Figure is consistent with information on increases of production at individual plants.

1974—Increase of 1.2 times over 1964 (FBIS I, Jan. 20, 1975, p. D21).

[2] Except where otherwise indicated, production from large plants is the difference between total production and that of small and medium plants.

[3] Information for small plants was obtained as follows:

1958—Large plant production was reported as 8,000,000 tons and total as 11.08, thus small plant production was 3.08 (FBIS, Sept. 2, 1959, p. BBB1—NCNA, Peking, Sept. 1, 1959).

1959—FBIS, Jan. 22, 1960, p. BBB7.

1960—Estimate that ⅓ of steel from small and medium plants; thus 12,450,000 tons was produced by large plants, a figure that appears reasonable from production estimates for individual plants. (See table 8.)

1965—From 1965 to 1972, production of steel by medium-sized and small plants rose 4 times (CMP-SCMP-73-38, September 1973, p. 101—NCNA, Peking, Sept. 6, 1973).

1969—Estimated that ratio of 1971 over 1969 (5 times) same as for pig iron (news from Hsinhua News Agency, Oct 2, 1972, p. 6).

1970—Production increased by 40 percent in 1971 over 1970 (FBIS I, Jan. 3, 1972, p. B10—NCNA, Peking, Dec. 31, 1971).

1971—Production increased by 16 percent in 1972 over 1971 (Peking Review, Jan. 12, 1973, p. 20).

1972—Medium and small plants accounted for 12 percent of total output (Peking Review, Oct. 5, 1973, p. 23).

1973—Increase of 17 percent (Peking Review, Jan. 11, 1974, p. 21).

1974—Estimate decline same as that for total production of steel.

China on Its Own

In the retrenchment following the Leap Forward, almost all of the small iron and steel plants were closed down. Production of steel fell from 18.67 million tons in 1960 to 8 million tons in 1961.

The withdrawal of Soviet technicans in mid-1960 had a great impact on the steel industry. Not only did the technicians leave the Chinese with two major unfinished plants—Wu-han and Pao-t'ou—but they also took with them the managerial and technical know-how that was in extremely short supply. The Chinese were fortunate to have enough Soviet-trained technicans and managers to repair the damages of the Leap Forward, to keep major plants in operation, and to generally finish the plants at Wu-han and Pao-t'ou. Shortages of finishing capacity in these two new plants remain a problem to this day. To add to the difficulties, the planners had failed to survey resources adequately. The coal to be used at Pao-t'ou for example, proved inadequate for coking. It took several years of experimentation before local coals could be used as part of the coking mix.

In the period of comparatively moderate policy (1961–65) after the Leap Forward, the Chinese began to look toward the West for modern steel technology. Basic oxygen furnaces were imported from Austria and air separation plants from Japan and other countries. The production of alloy steels was greatly increased by expansion of electric steel capacity—mostly through imports of electric furnaces from Japan.

By 1966, steel production had increased to 15 million tons, only 20 percent greater than production from modern plants in 1960 but of much better quality and variety. Pao-t'ou and Wu-han were contributing a total of about 1.5 million tons to national production at that time.

The Cultural Revolution (1966–69) caused another downturn in steel production, mainly because of coal shortages and transportation tie-ups. Compared with the Leap Forward, the difficulties were minor and temporary. Following the Cultural Revolution, steel production expanded rapidly, reaching 25 million to 26 million tons in 1973. Part of the expansion resulted from the reintroduction of small plants. These plants were an improved version of the earlier small plants and produced iron and steel mainly for local consumption. They used local labor and raw materials to a great extent. When their demands on the local labor supply threatened to damage agricultural production in 1971–72, the Chinese cut back on their construction and concentrated on the improvement of existing small and large plants.

In 1974, production of steel apparently fell back, as the political turmoil of the anti-Confucius campaign led to work stoppages at some plants. Even without this campaign, however, production increases would have fallen off. The industry was operating near peak capacity at all levels; new capacity was not being added rapidly enough to continue large production increases; and segments of the industry, for example, finishing capacity and supplies of ore and scrap, were getting out of balance.

In 1973–74, China contracted for a large steel-finishing facility to be installed at Wu-han which will help to meet expansion needs in the finishing sector in the late 1970's. In addition, the government has been increasing investment in ore processing plants, coal and iron ore mines, and coal beneficiating plants to improve the supply of raw materials for the industry; thus far, purchases of foreign equipment play only a small role in these investment projects.

V. Current State of the Industry

Shortages of organizational skills, technical expertise, and capital have held back the growth of nearly all sectors of the steel industry and have contributed to major imbalances. The following discussion describes the problems and the means by which they are being confronted.

Raw Materials

The inadequacy of China's iron ore and coal for direct charging into ironmaking furnaces is the major stumbling block on China's path to self-sufficiency in steel production. Heavy investment in coal and iron ore beneficiation equipment was recommended by Soviet and Western experts but Peking spurned their advice until more labor intensive methods could be tried, for example, the backyard furnaces of the Leap Forward. It is now evident that losses of efficiency in blast furnaces charged with poor ore and coke are costing China more than the beneficiation of these raw materials would cost.

China's policies of the 1960's and early 1970's have been taking the industry further away from self-sufficiency in coke and iron ore. The PRC must make a concerted effort if that trend is to be reversed. The Chinese press reflects greater emphasis on the mining and ore processing sector of the industry, and imports of coal and iron mining equipment rose in 1973 and 1974. If Peking follows through on these efforts, it may be able to catch up with the expanding need for blast furnace feed materials in the early 1980's. In the meantime, the PRC will have to import iron ore. China will probably not be driven to import coking coal because it can make up shortages of top-quality coking coals through the substitution of lower quality coals in the coking mix.

Ironmaking

Whereas China produced a surplus of pig iron for export throughout the 1950's and 1960's, it has had to import pig iron in recent years. (See table 6.) Growth in pig iron production has been insufficient to match China's capacity to make steel and cast iron products.

TABLE 6.—FOREIGN TRADE IN IRON AND STEEL PRODUCTS, 1950–74 [1]

[In thousands of tons]

Year	Iron Ore Exports	Iron Ore Imports	Coke exports	Pig iron Exports	Pig iron Imports	Scrap imports [2]	Finished steel Exports	Finished steel Imports
1950	200	-	-	150	-	-	-	630
1951	150	-	-	150	-	-	-	590
1952	360	-	-	150	-	-	-	530
1953	440	-	-	170	-	-	-	930
1954	500	-	-	250	-	-	30	650
1955	720	-	-	650	-	-	50	870
1956	810	-	20	600	-	-	200	760
1957	630	240	(3)	200	-	-	90	530
1958	300	400	10	180	-	-	150	1,650
1959	390	400	(3)	170	-	-	100	730
1960	330	410	-	220	-	-	40	780
1961	70	400	-	230	-	-	90	230
1962	30	-	(3)	180	-	-	170	190
1963	40	-	(3)	290	-	-	-	230
1964	60	20	10	1,260	-	-	-	370
1965	230	10	10	600	-	(3)	100	720
1966	320	-	-	540	-	30	-	1,290
1967	250	-	-	230	-	340	-	1,600
1968	70	-	-	50	(3)	70	-	1,680
1969	20	-	-	(3)	(3)	130	120	1,770
1970	-	30	230	-	140	140	-	2,150
1971	-	30	230	(3)	770	340	-	2,200
1972	-	-	-	-	930	370	-	2,500
1973	-	-	-	-	1,060	640	-	3,100
1974 (preliminary)	-	-	-	-	1,000	300	-	3,000

[1] Estimates are based largely on trading statistics of China's trading partners. Figures are rounded to the nearest 10,000 tons.
[2] Ships purchased for demolition are excluded from some trading partner data.
[3] Negligible.

Pig iron imports seem destined to continue to grow for the next several years. China apparently is not accelerating the construction of new blast furnaces. Although the press frequently announces production increases achieved through improved blast furnace efficiency, the Chinese have a long way to go before their blast furnaces produce at Western standards of efficiency. Accordingly, China can attain considerable production increases from existing blast furnace capacity for several more years. While Chinese technicians are making progress in improving the efficiency of blast furnace operation, the greatest gain in iron production will be attributable to the use of better feed materials through beneficiation of ore and coal. However, without rapid new construction, pig iron capacity will not keep up with projected demand for pig iron through 1980.

For making pig iron, China has relied on two basic types of blast furnaces—modern and native. Modern furnaces are based on Soviet designs obtained during the 1950's. The USSR provided extensive technical assistance and equipment both for the construction of many furnaces and for the restoration of the furnaces in place at the time of the Communist takeover. After the Soviet withdrawal, China continued to construct its blast furnaces according to the Soviet designs with modifications for subsequent technological development. Construction without Soviet help, however, has been slow and difficult.

For example, construction of a furnace at the Wu-han Iron and Steel Co. that had started during the Leap Forward was not completed until 1969.

Though the Soviet-designed blast furnace has become somewhat outdated, it is in many respects a well-built furnace. Modern instrumentation and automatic equipment have been added to most of the larger furnaces and are gradually being installed at the smaller units.

China builds several standard sizes of modern blast furnaces. They range from a small furnace with a volume of 55 cubic meters and a designed annual capacity of about 25,000 tons to a large furnace with a volume of 2,005 cubic meters and a capacity of more than 1 million tons. More than two-thirds of China's pig iron capacity is in smaller blast furnaces having less than 500,000 tons in annual capacity and less than 1,000 cubic meters of furnace volume. A number of the smaller units are installed at medium-sized plants which together with small plants produce nearly 30 percent of China's total pig iron output. (See table 4.)

In addition to modern blast furnaces, the People's Republic has a tiny, almost primitive furnace often referred to as a native blast furnace. It represents the lowest level of blast furnace technology. The infamous backyard furnaces of the Leap Forward era were the first native-style furnaces built. The present native blast furnaces are scaled-down modern furnaces and are found mostly in rural areas. Their capacities range from a few thousand tons to as high as 10,000 or 20,000 tons. Often they have been built from discarded equipment and materials. Because of their small size and the low quality of their construction, the native blast furnaces cannot effectively employ various operating practices that have made the modern blast furnace more productive. At best, they are partially mechanized and the low quality iron produced can be refined into an ordinary steel. Much of the product is converted to cast iron and used in simple agricultural implements for which better iron or steel is not essential. Native furnaces probably comprise less than 10 percent of total pig iron capacity.

Steelmaking

The making of crude steel is the strongest stage in the PRC iron and steel industry. As for earlier stages, China's ironmakers and scrap collectors cannot keep the steelmakers supplied with raw materials. As for later stages, steel finishing mills can barely cope with the outflow of crude steel.

China employs a wide variety of steelmaking equipment. Open-hearth furnaces (OHF) comprise 60 to 70 percent of total capacity; basic oxygen furnaces (BOF) comprise 15 to 25 percent; side blown converters (SBC), 10 to 15 percent; and electric furnaces, 5 to 10 percent. Very little of China's steelmaking capacity employs modern methods, but some of the outdated technologies offer special advantages for China. For example, side-blown converters can be built cheaply and require comparatively little skill to construct and operate; they thus are well suited for the initial stages of industrialization in outlying areas.

China is fortunate in its large committment to the open hearth furnace. The OHF can accept a wide variety of charges of hot metal, cold pig iron, and scrap. This flexibility allows China to maintain production while it undergoes rapid changes in industrial technology.

The open-hearth furnace was extensively used in the 1950's by the world's leading steel producers. In the 1950's China obtained substantial Soviet and East European assistance in rebuilding and enlarging the several OHF's built before 1949 and in constructing numerous large, modern OHF's. After the Soviet withdrawal, China completed several OHF's that had been started at the Pao-t'ou and Wuhan Steel Plants. Although China has released few details about its current OHF operations, it has characterized them as "labor intensive", implying a minimum of mechanized operations.

The three integrated plants at An-shan, Wuhan, and Pao-t'ou almost exclusively rely on OHF's and account for the bulk of China's open-hearth capacity. Their combined annual capacity amounts to about 10 million tons. Almost all of the nearly 40 units at these plants are at least 200 tons in size. The largest are 500-ton OHF's with an originally designed annual capacity of 450,000 to 500,000 tons, a size which compares favorably with the largest OHF's in the U.S. and U.S.S.R. Several other plants have smaller OHF's, some as small as 25 and 50 tons. China has expanded the productivity of its OHF's by such means as increasing labor efficiency and improving maintenance practices. Probably more important is the introduction of oxygen injection. Experimentation with oxygen injection began at the two OHF's in Shanghai in 1970 and reportedly resulted in an increase of 20 percent in output by March 1972.[7]

During the Leap Forward construction of OHF's lagged behind steelmaking needs and the Chinese adopted a supplemental, crash program to build hundreds of small side-blown converters (SBC). The SBC is the standard steelmaking furnace for the local plants; many were also built in the larger, centrally controlled iron and steel plants. After the collapse of the Leap Forward, most SBC's were closed down until the late 1960's when many were restored. The SBC with its quick startup time and low capital costs successfully expanded steel output; nonetheless, the SBC is a generally outmoded and inefficient steelmaking process which yields only mediocre quality steel. Even at small plants the SBC has a limited future because it does not adequately remove sulfur and other impurities found in the low-quality ores available to these plants.

China has been slow to introduce the basic oxygen process which in the last two decades has come to dominate steelmaking in the most advanced steelmaking countries. In part this was because the U.S.S.R. had only just begun to provide assistance in building BOF's for China when it withdrew its technicians. By the mid-1960's, China completed its first BOF's—3 small, 30-ton furnaces with a combined annual capacity of 500,000 tons—at the Shih-ching-shan Iron and Steel Plant in Peking.[8] China had to rely on foreign suppliers for some of the more advanced or complex equipment, in particular large air separation plants, computers, and steel analysing instruments. Continued imports of such auxiliary equipment indicates that China has built several other BOFs, some of which are larger. In 1970 China built a

[7] *Kuang-ming Jih-pao,* Peking, July 17, 1972, p. 4.
[8] *Jen-min Jih-pao,* Peking, June 15, 1965.

120-ton BOF at the Shanghai No. 1 Steel Works.[9] Two 55-ton BOF's, including an air separation plant purchased from Austria in 1965, probably also were completed around 1970.

China can be expected to build its next BOF's at the Wuhan Iron and Steel Plant. The Wuhan finishing mill that is being imported from Japan and West Germany includes a continuous slab caster. Because the open hearth furnaces now used at Wuhan cannot provide the frequent batches of molten steel needed to operate a continuous caster, a BOF will be required. The new BOF will, in turn, require additional blast furnaces because the BOF must have a steady supply of molten iron.

Many small BOF's, ranging from 3 to 10 tons in size, have been constructed at China's small and medium plants. These appear to be little more than side-blown converters with the addition of an oxygen lance and hood. They are important to local industry because the quality of steel made in the small BOF's is far superior to that from the SBC's.

China has greatly expanded its electric furnace (EF) capacity for making high quality and specialty steels since 1949. During the 1950's the PRC restored the EFs inherited from the Japanese occupation, imported new EF's, and developed a modest capability for manufacturing its own EF's. China is still building EFs and enlarging existing ones. Imports of conventional EF's have practically ceased. China's interest in foreign technology during recent years has focused on vacuum steel making and electron beam furnaces.

China's EF's on the whole are small and inefficient. They range up to 20 tons in heat capacity, with most no larger than 10 tons. An indication of the generally poor efficiency of China's EF's is that an EF shop in Shanghai was able to cut heat time in half and to get 10 times the number of heats during each period between overhauls.[10]

The People's Republic can produce small quantities of a wide variety of stainless steels, electrical steels, and even superalloys. The growing volume of imports of these steels suggests that output is not growing fast enough to keep up with expanding requirements. China will be unable to attain self-sufficiency in specialty steels without extensive foreign technical aid.

Steelfinishing

The steelfinishing sector is inadequate to meet domestic needs, as evidenced by the rise in finished steel imports during the past decade. The demands on the sector are not so much for greater tonnage as for better quality and variety of products. Finished steel production and consumption are shown in table 7.

[9] FBIS I, May 26, 1970, p. C13.
[10] *China Pictorial*, No. 1, January 1969, p. 17.

TABLE 7.—CHINA: PRODUCTION AND CONSUMPTION OF FINISHED STEEL, 1949-74

Year	Total production (million tons)[1]	Ratio of finished steel to crude steel[2]	Net imports (million tons)[3]	Consumption (million tons)[4]
1949	0.123	0.78		0.123
1950	.36	.59	0.63	.99
1951	.69	.77	.59	1.28
1952	1.11	.82	.53	1.64
1953	1.49	.84	.93	2.42
1954	1.77	.80	.62	2.39
1955	2.22	.78	.82	3.04
1956	3.22	.72	.56	3.78
1957	4.29	.80	.44	4.73
1958	6.10	.55	1.50	7.60
1959	8.1	.61	.63	8.73
1960	11.3	.61	.74	12.04
1961	6.0	.75	.14	6.14
1962	6.0	.75	.02	6.02
1963	6.8	.75	.23	7.03
1964	8.1	.75	.37	8.47
1965	9.4	.75	.62	10.02
1966	11.2	.75	1.29	12.49
1967	9.0	.75	1.60	10.60
1968	10.5	.75	1.68	12.18
1969	12.0	.75	1.65	13.65
1970	13.4	.75	2.15	15.55
1971	15.4	.73	2.2	17.6
1972	16.9	.73	2.5	19.4
1973	19.1	.75	3.1	22.2
1974	17.8	.75	3.0	20.8

[1] Data for total production were derived as follows:
1949, 1953-58—JPRS 3129, Mar. 29, 1960, p. 1.
1950-51—"Jen-min Jih-pao," Peking, Sep. 28, 1974. Index numbers were adjusted to accord with the 1952 and 1949 figures.
1952—"First Five-Year Plan for Development of the National Economy of the People's Republic of China in 1953-57," Foreign Language Press, Peking, p. 48.
1959—By the end of September production had surpassed that for all of 1958 (FBIS, Oct. 20, 1959, p. BBB2—NCNA, Peking, Oct. 16, 1959).
1960—Calculated by using same ratio of finished steel to crude steel as in 1959.
1961-65, 1967-70, 1973-74—Calculated by using 0.75 of total steel production.
1966—Increase of 20 percent over 1965 (New York Times, Sep. 28, 1966, p. 5).
1971—Increase of 15 percent over 1970 (FBIS I, Jan. 3, 1972, p. B14—NCNA, Peking, Dec. 31, 1971).
1972—Increase of 10 percent over 1971 (Peking Review, Jan. 12, 1973, p. 9).

[2] Estimates for the ratio of finished steel to crude steel are calculated from production figures except for 1960 which is estimated to be the same as 1959 and for 1961-65, 1967-70, and 1973-74 which are assumed to be 0.75, the approximate average ratio for those years excluding the leap forward years for which production data are available.

[3] See table 6.

[4] Calculation, total production plus net imports.

Finishing mills include a few large blooming and rail/structural mills and a considerable number of small to medium-sized rod and bar, plate, sheet, and welded and seamless tube mills. China has only a few small continuous or semi-continuous sheet mills, tinplating, and galvanizing lines, a reflection of the deemphasis of consumer goods production. Most mills are designed for hot-rolling, only a few for cold-rolling. Extensive foundry and forging facilities have been built.

Most finishing mills have incorporated Soviet technology of the 1950's. This is true of equipment supplied by the U.S.S.R., and equipment manufactured by Chinese machine-building plants using Soviet designs. The U.S.S.R. appears to have provided soundly constructed and mechanized mills which matched the Soviet state-of-the-art at that time. In at least one case, that of soaking pit technology, a Soviet weakness was passed on to the Chinese. The PRC enthusiasm for continuous casting is probably due in large part to the opportunity that this technology affords to circumvent the need for soaking pits. Continuous casting is one of the few technologies that China has advanced on its own. Continuous casting machines were developed and built at the Shih-ching-shan Iron and Steel Plant in Peking and at the Shanghai No. 3 Iron and Steel Plant. The Shanghai caster was built in 18 days during the Cultural Revolution and served as a prototype for several other small installations around the country.[11] Because they were hastily built, frequent difficulties were encountered and these continuous casters may never have attained smooth operation.

The Wuhan Iron and Steel Plant will be the focal point of progress in China's steel industry during the remainder of the 1970's. The PRC has contracted to import a steel finishing complex to be erected in Wuhan by 1977. The equipment is being built by both Japanese and West German companies for a total price of over $500 million. The largest unit in the new complex will be a 1,700 millimeter hot strip mill having a yearly capacity of 3 million tons. Also included will be a continuous slab caster, an electrical sheet plant, a cold rolling mill, and galvanizing and tinplating lines. The Chinese are breaking with their usual policy by allowing Japanese and German technicians to go to Wuhan to set up the new equipment.

The new Wuhan finishing mill will go a long way toward eliminating China's need for imports of flat rolled steel. Even so, growth in demand for finished steels will keep the PRC from becoming completely self-sufficient in flat rolled steel by the end of the decade.

VI. Prospects

China's iron and steel industry is moving toward dependence on larger production units. Thus advances in capacity and output will tend to come in discrete jumps. Imports of iron ore, pig iron, and scrap will continue for at least 5 years, even assuming a crash program to increase domestic production. In several areas, such as steel-finishing, electric and basic oxygen steel furnaces, and ore beneficiation, the Chinese must import foreign equipment and technology if the steel industry is to modernize and regain internal balance.

The People's Republic has a choice between drifting toward greater dependence on imports of raw, semifinished, and finished steel products, or stressing imports of equipment and technology to bring domestic capabilities up to rising requirements. The former route runs counter to Peking's long standing policy of self-reliance, so the regime probably will opt for the latter choice. The latter policy runs up against the demands on foreign exchange, which have been unusually pronounced in 1974 and early 1975. A further consideration is that international raw material prices probably will mount faster over the next decade than prices of machinery.

If China continues to make maximum use of domestically produced and imported capital, by 1980 the steel industry could (a) resume rapid growth, (b) restore internal balance, and (c) reduce its depend-

[11] *China Pictorial*, No. 1, January 1969, p. 19.

ence on imported raw materials. The alternative is increased dependence on the outside world for the raw materials and finished products of an industry critical for national power. In view of the stakes, we anticipate a strong investment push in China's iron and steel industry.

Appendix

China: Major Iron and Steel Plants

China has at least eight iron and steel plants that produce 1 million tons or more of steel annually (see table 8). An-shan continues to be the No. one plant in China producing nearly 25 percent of national output. Shanghai has been developing rapidly since 1965 and now produces more than 4 million tons. Next most important are the plants begun with Soviet aid in the 1950's at Wuhan and Pao-t'ou. The old Shih-ching-shan Plant in Peking began to produce steel in the late 1950's and has been greatly expanded since. Plants at Chungking, T'ai-yuan, and Ma-an-shan round out the top eight.

The An-shan Iron and Steel Complex was developed by the Japanese between 1915 and 1945 to take advantage of nearby resources of coking coal and iron ore. By 1949, production at the plant was almost at a standstill. The Soviets had removed much of the equipment following World War II, and the retreating Nationalist Chinese destroyed most of the remainder. After the Communist takeover, the plant was quickly rebuilt with Soviet aid. By 1957, production had surpassed the prewar peak. Expansion and modernization continue at the plant. Silicon steel sheet in coils was produced for the first time in 1970[12] and the eleventh large blast furnace was installed in 1972.[13]

TABLE 8.—CHINA: ESTIMATED CRUDE STEEL PRODUCTION AT MAJOR IRON AND STEEL PLANTS, SELECTED YEARS, 1957-74

[In millions of tons]

Plant or category	Year 1957	1960	1965	1970	1972	1973
Modern plants:						
An-shan [1]	2.9	5.4	4.3	4.5	5.3	5.9
Shanghai [2]	.5	2.6	1.9	3.0	3.8	4.2
Wuhan [3]	0	.2	.9	1.4	1.7	1.8
Pao-t'ou [4]	0	.3	.5	1.0	1.4	1.6
Peking—Shih-ching-shan [5]	0	.4	.4	.7	1.2	1.6
Chungking [6]	.4	1.1	1.0	.7	1.1	1.2
Ma-an-shan [7]	Negl.	.3	.4	.7	1.1	1.2
T'ai-yuan [8]	.3	.5	.5	.5	1.0	1.2
Other modern plants [9]	1.3	1.7	2.1	3.6	3.6	3.6
Total modern plants	5.4	12.5	12.0	16.1	20.2	22.3
Small plants [10]	Negl.	6.2	.5	1.7	2.8	3.2
Total production	5.4	18.7	12.5	17.8	23.0	25.5

[1] An-shan:
1957—"China Reconstructs," May 1958.
1960—Based on production equipment available and technical coefficients derived from a number of sources.
1965, 1973—Based on increase of 1.6 million in 1973 over 1965 (Peiping, "Jen-min Jih-pao," Apr. 9, 1974) and minimum of 37 percent increase from 1965 to 1973 (FBIS I, Feb. 19, 1975, p. L5—Shen-yang, Liaoning Provincial Services, Feb. 9, 1975).
1972—Based on increase in national output, 1973 over 1972.
1970—Based on percentage increases for 1972 over 1971 (8 month figure reported in Peiping, "Jen-min Jih-pao," Sept. 13, 1972) and 1971 over 1970 ("China Reconstructs," June 1972, p. 27).

[2] Shanghai:
1957—"Shanghai Kung-shang," No. 19-20, Oct. 5, 1959, pp. 15-20.
1960—Kweiyang, "Kweichow Jih-pao," Dec. 31, 1960, p. 4.
1972—Produced as much in ½ day as all of 1949 (5,233 tons)—Hong Kong, "Wen-hui Pao," Jan. 5, 1973, p. 3.
1965—Production reported to be double 1965 in 1972—FBIS I, Feb. 13, 1973, p. C6.
1970—Worked backwards from 1971. Production for 1971 was 634 times 1949 output or 3,317,700 tons—FBIS I, Mar. 22, 1972, p. C2. Production for 1971 is estimated to have increased by about 10 percent over 1970.
1973—Same rate of increase as national total.

[3] Wu-han:
1957—The plant began operations in 1958.

[12] *China Reconstructs*, February 1971, pp. 11–13.
[13] *Peking Review*, Sept. 29, 1972, p. 10.

3 Wu-han—Continued
1960 and 1965—Based on a number of visitor reports and on technical relationships in the industry.
1970—Diplomat who visited plant reported 1970 production figures.
1972—Steel output was at an all-time high and 88 percent above 1965 ("Economic Reporter," English supplement. p. 24).
1973—Steel output was more than double 1965 "(China Reconstructs," May 1974, p. 38).
4 Pao-t'ou:
1957—Steel was first produced in 1960.
1960—Based on known addition of 2 open-hearths in 1959-60.
1965—Based on known capacity in 1966, estimate that this capacity was being fully utilized in that year, and report that steel output increased by 107.5 percent in 1966 over 1965 in first 8 months (Peiping, "Jen-min Jih-pao," Sept. 24, 1966, p. 1).
1970—Estimate that plant regained 1966 production levels; no known increase in capacity.
1972-73—Based on capacity of equipment (2 pure-oxygen top-blown converters were added in 1970 according to BBC, Summary of World Broadcasts, SWB/FE/W604/11, Jan. 13, 1971, and straight line interpolation for 1970-73.
5 Peking—Shih-ching-shan:
1957—No known production of steel.
1960—Based on increase of 35.8 percent in first 10 months of 1960 over all of 1959 (NCNA, Nov. 6, 1960) and 1959 estimate of production of 232,000 tons (NCNA, Sept. 10, 1959). Reported that 206,000 tons had been produced in first 8 months but this included production from primitive facilities which according to same source accounted for ¼ of production in 1958.
1965—Production in 1974 was 10 times as great as national production in 1949 (158,000 tons) and 4 times as great as in 1965 (FBIS I, Jan. 28, 1975, p. K4). Therefore, production in 1965 was 395,000 tons.
1970—Production in 1970 was 68% above that of 1969 (JPRS 61407), 1969 was an all-time high (FBIS I, Dec. 20, 1971, p. F7), and 1972 production was 3 times that of 1966. Therefore, 1966 production was 400,000 and 1969 was estimated as 410,000 tons. Production in 1970 then was 689,000 tons.
1972—JPRS 61407, Mar. 6, 1974, (from "Nhan Dan," Dec. 17, 1973, p. 3).
1973—10 times national production in 1949 (FBIS I, June 26, 1974, p. E4—NCNA, Peking, June 22, 1974).
6 Chungking:
1957—Output in 1957 was ½ of 1958 plan (BBC, Summary of World Broadcasts, SWB 326, July 17, 1958, p. 9).
1960—Based on increases reported for 1958 (Peking, "Jen-min Jih-pao," Apr. 25, 1959), the 1st half of 1959. (FBIS, July 7, 1959, p. BBB7), and the 1st half of 1960 (Hankow, "Hupeh Jih-pao," Aug. 22, 1960, p. 4).
1965—Estimated that production near previous peak of 1.1 million tons (1960).
1970—Derived by using estimates of 10 percent increases in 1972-73 and 1971-72 and an increase of 41 percent reported for 1st 11 months of 1971 (Chengtu, Szechwan Provincial Service, Dec. 19, 1971).
1973—Final planned output of plant ("Metal Bulletin", June 24, 1960, p. 1).
7 Ma-an-shan:
1957—"Metal Bulletin," Apr. 5, 1960, p. 9.
1960, 1970—Based on known equipment and given or estimated operating coefficients.
1965—Steel production increased by 76 percent in 1970 over 1965 (FBIS I, Dec. 20, 1971, p. C1.)
1972—Steel production in 1972 was 2.58 times that of 1965 (Peking, "Chung-kuo Hsin-wen," May 9, 1973, p. 3).
1973—Steel production increased by 14.5 percent in 1st quarter (FBIS I, June 4, 1973, p. C12).
8 T'ai-yuan:
Practically no information available for this plant but estimate sizeable (over 1 million tons) because of equipment installed.
1957—Calculated: 1957 equals 22 times preliberation peak of 13,500 tons (FBIS 57 W 867, Peking, Aug. 11, 1957).
1960—Based on availability of equipment and estimated production coefficients.
1965—Estimate that attained previous peak level in 1966 and production in 1966 was 10 percent above 1965.
1970—Estimate slightly below previous peak level due to large increases reported for later years—53.5 percent in 1971 (T'ai-yuan, Shansi Provincial Service, Jan. 1, 1972).
1972—Probably another large increase-estimate 25 percent.
1973—Production up 32.3 percent in 1st quarter and estimate 25 percent for year (Hong Kong, "Ching-chi Tao-pao," Apr. 11, 1973, p. 16).
9 Residual.
10 See table 5.

In contrast to An-shan, Shanghai was a minor producer of steel before the Communist takeover. Rapid expansion began in the late 1950's and production reached 2.6 million tons in 1960. The addition of top-blown oxygen converters in 1966[14] and a vacuum degassing unit in 1972[15] helped boost production in 1971-73. The Shanghai complex which specializes mainly in steel production, consists of as many as 10 individual plants. In 1965, only 270,000 tons of pig iron were produced.[16] Some of the steelmaking capacity consists of electric furnaces. Pig iron and scrap metal are shipped from other parts of China and converted to finished steel products for use in the Shanghai area, particularly in the city's thriving machinery industry.

Construction began on the Wu-han Iron and Steel plant in 1958. The first heat of iron was produced by September of that year. By 1960, two large blast furnaces and one large open hearth furnace accounted for 1.2 million tons of pig iron and about 165,000 tons of steel. The third large blast furnace was completed in 1969[17] and the fourth in 1970.[18] In the meantime at least two more open hearth units were added. Steel finishing capacity has been completed very slowly at this plant. Most of the machinery that was to be provided by the Soviet Union was never delivered and in the 1960's the Chinese were able to provide only a few pieces of simple equipment. The problem probably will be

14 *China Reconstructs*, April 1967, p. 21.
15 *Peking Review*, Nov. 16, 1973, p. 21.
16 Estimate based on equipment known to exist at the plant at that time.
17 *Economic Reporter*, April-June 1969, pp. 33-34.
18 JPRS 54739, Dec. 17, 1971, p. 12.

resolved only after the equipment purchased from Japan and West Germany is delivered or sometime around 1978.

Construction at Pao-t'ou also began in 1958. Production of pig iron was initiated in 1959 and of steel in 1960. This plant has been beset by problems of obtaining suitable coal (see the section on coke, above). The installation of equipment, especially rolling equipment, was greatly delayed by the withdrawal of Soviet technicians. Expansion has continued, however—the plant now probably has three large blast furnaces and five open hearths. The last two converters use pure oxygen in line with the latest technology.[19] Improvements in ore preparation in 1970[20] and the completion of a steel rail-beam mill in 1968[21] have helped to stimulate recent increases in output.

Before 1958, the Shih-ching-shan plant in Peking only produced pig iron. Even by the mid-1960's steel production was only a third of pig iron production as the pigs were shipped elsewhere for refining. Since 1969, the addition of several open hearths has brought about an even balance between pig iron and steel production. Also, another large blast furnace has been added in recent years. Modern oxygen-fed equipment and rolling mills have been built at his plant, and a new mine was opened in 1972[22] to provide iron ore. This plant is now called the Capital Iron and Steel Plant.

The old Chungking plant developed by the Chinese Nationalists when they retreated to Szechwan is producing at only a slightly higher rate than it did in 1960 and 1965. Major expansion took place at this plant during the Leap Forward partly through expansion and modernization of existing facilities and partly by adding small blast furnaces for producing pig iron. Since 1960 further modernization has taken place including the addition of a giant conveyor system in 1965.[23]

The Ma-an-shan Steel Plant has gone from a small-scale plant to a large-scale modern facility. In the late 1950's, a number of medium-sized blast furnaces and open hearths were added. In a flurry of activity in the late 1960's, the plant was transformed into one of the most modern steel facilities in the country. The transformation included a great expansion of ore mining and beneficiating facilities, which made the complex self-sufficient in ore production. Also, two convertors were changed to pure-oxygen top-blown convertors; a limestone mine was built; rolling mills were improved; and silicon steel was trial produced. In 1971 alone, 10 major projects were started at the plant.[24] As a result pig iron output is now nearly 2 million tons or 1½ times output in 1960, and steel output has quadrupled over the same period.

The old steel facility at T'ai-yuan has been greatly expanded especially through the addition of BOFs imported from Austria in the mid-1960's.[25] These converters contributed to the estimated doubling of production in the 1970's. An annealing furnace was added at the sheet steel rolling mill in 1973, which raised the mills productivity by nearly 20 times.[26] Earlier, in 1970 a large sintering plant was built.[27] The plant apparently has cold rolling facilities to produce grain-oriented silicon steel for the electrical equipment industry. In addition, pig iron output has been increased through the renovation of at least one of the blast furnaces.

Two other iron and steel plants might fit into the category of large plants. One is the old Pen-chi plant in Northeast China. This plant produces more than 1.5 million tons of pig iron annually, but steel production is small, probably less than 200,000 tons.[28] The other is a large plant that the Chinese claim has been completed in the interior[29] possibly somewhere along the newly opened Ch'eng-tu-K'un-ming railroad. Earlier reports claimed that large deposits of iron ore are located near Hsi-ch'ang in southwest Szechwan Province and that coking coal has been found near Hsuan-wei in Yunnan so the plant could be located

[19] BBC, *Summary of World Broadcasts*, FE/W 604/A/11, Jan. 13, 1971 (NCNA, Peking, Jan. 3, 1971).
[20] FBIS I, Dec. 21, 1970, p. F3 (NCNA, Peking, Dec. 20, 1970).
[21] *Jen-min Jih-pao*, Feb. 1, 1969, p. 1.
[22] BBC. *Summary of World Broadcasts*, FE/W669/A/15, Apr. 19, 1972.
[23] FBIS 65, B1112, (Chengtu, Mar. 21, 1965).
[24] FBIS I, Apr. 7, 1972, p. C1 (NCNA, Peking, Apr. 7, 1972).
[25] *Far Eastern Economic Review*, Mar. 23, 1967, p. 570.
[26] *Chung-kuo Hsin-wen*, Peking, Sept. 18, 1973, p. 6.
[27] CMP–SCMP 71–23, p. 17 (NCNA, Peking, Mar. 31, 1971).
[28] Estimates of production of pig iron and steel are based on the amount of equipment available in 1965, and reports of expansion of facilities and improvements in operating efficiency since 1970.
[29] FBIS I, Dec. 28, 1973, p. B3 (NCNA, Peking, Dec. 27, 1973).

somewhere near the Yunnan-Szechwan border. The Chinese have chosen not to provide any details on the precise location or size of this facility.

Most noteworthy among the medium-sized modern plants are the plants at Fu-la-erh-chi, Tang-shan, and Ta-yeh (Huang-shih). The Fu-la-erh-chi plant, an electric furnace facility, is a major producer of high quality alloy steel. It was one of the major Soviet-aid projects of the 1950's. The Tang-shan plant rapidly approaching major plant status, produced 707,000 tons of steel in 1972 as compared to only 239,000 tons in 1957.[30] The Ta-yeh plant, located near the major iron ore deposits in eastern Hupeh, was built up during the Leap Forward. Its production probably amounts to 300,000–400,000 tons. Other medium-sized plants are located at Canton, Chiang-yu, Dairen, Hsiang-tan, Hsuan-hua, K'un-ming, Shen-yang, and Tientsin. (See figure 1.)

[30] *Chung-kuo Hsin-wen,* Peking, Sept. 10, 1973, p. 11.

CHINA: DOMESTIC AND INTERNATIONAL TELECOMMUNICATIONS, 1949–74

By Jack Craig

CONTENTS

I. Summary and Conclusions

For nearly a quarter of a century, the People's Republic of China has engaged in a series of programs aimed at establishing a telecommunications system that would meet the basic needs of the economy, the government, and the armed forces. When the Communists achieved power in 1949, they inherited a primitive and badly damaged telecommunications system. For the next 3 years, the main task was to restore the system to its former state to satisfy the most pressing communications needs of the new government.

By 1953, the Communists were prepared to expand the existing system and to link the major provincial cities to Peking by open wire trunklines. Substantial progress was made during the First Five-Year Plan (1953–57), although the Chinese were heavily dependent on Soviet and East European equipment and technology. In 1958, as part of the euphoric Great Leap Forward, Peking announced a new 4-year plan to establish a modern telecommunications system, complete with high-capacity microwave radio relay and coaxial cable trunk routes. Shortages of material and equipment, the withdrawal of Soviet assistance in mid-1960, and the general collapse of the Leap Forward forced the Chinese to postpone their highly ambitious program.

After a pause in the early 1960's, expansion of the telecommunications system was again given high priority.

Greater attention was given to the development of the electronics industry. Complete plants for the production of electronic components and test instrumentation were imported from the West. The Cultural Revolution (1966–69) caused a sharp but short-lived cut in industrial production. The adverse effect on the production of telecommunications equipment was temporary, and the technological improvement and the expansion of the capacity of the electronics industry continued.

The most significant achievement during China's current Five-Year Plan (1971–75) has been the construction of an arterial network of long-distance telecommunications facilities to provide the transmission base for future increases in the flow of conventional and specialized telephone, telegraph, and video traffic. Other achievements during this period have been the spread of radio, wire diffusion, and television broadcasting facilities and the establishment of a nationwide television network. This has been accomplished by substantial increases in the production of radio and television receivers and wire loudspeakers. Progress also has been made in augmenting both facsimile facilities and automating conventional telegraph operations as well as in enlarging and automating telephone exchanges. These achievements have fulfilled China's basic needs for long-range development of a domestic telecommunications system.

Progress also has been made in developing China's international telecommunications. Since 1972, three standard Intelsat ground stations have been purchased from the United States. A coaxial cable link has been established between Canton and Hong Kong, and agreement has been reached with a Japanese consortium to lay a coaxial submarine cable from Shanghai to Japan. Efforts also are being made to improve the quality of radiotelephone circuits and to expand international telecommunications by using the transit relay services offered by major world telecommunications centers.

Despite these successes, China still has far to go before it can attain a telecommunications capability comparable to Western systems. Telephones continue to be in short supply. Telegraph service is limited by the nature of the written language. Use of a numeric code partly overcomes this problem, and the Chinese are starting to use computer-controlled electrostatic printers and facsimile equipment. Plans are also under way to introduce color television on a national scale even though the black-and-white system is only narrowly developed. China cannot solve its many telecommunications problems within the next 5 years unless an unparalleled effort is made to import large quantities of costly Western equipment and technology. The more likely course is moderate progress based on expanded domestic output of telecommunications products and import of key products and equipment for their manufacture.

II. Historical Development

Rehabilitation (1949–52)

When the Communists seized control of the mainland in late 1949, they took possession of the primitive war-damaged telecommunications system established by the Nationalists. Effective service was limited to Manchuria, to isolated sections around large coastal cities, and to a few interior cites. Facilities included a heterogeneous mixture of obsolete equipment badly in need of repair. Capacity was too small and service too undependable to meet the needs of the new government.

The immediate task of the newly formed Ministry of Posts and Telecommunications (MPT) was to restore the existing system. Primary goals included extension of coverage, improvement of service, modernization of facilities, and training of technicians and skilled communication operators. By 1952, the telecommunication system was restored to the level reached in about 1936.

First Five-Year Plan (1953–57)

The principal objectives of the First Five-Year Plan were to establish communications links between Peking and major provincial points. Long-distance open-wire telephone lines were strung between Peking and most provincial capitals; point-to-point radio communications service was improved; conference telephone service was introduced; and domestic production of telecommunications equipment was increased. Twelve-channel carrier equipment was introduced on some trunk routes, and the principle of the four-stage radial link system was adopted, using Peking as the center, for organizing the long-distance telephone network.

In contrast to these achievements, the First Five-Year Plan period was also an era of overzealousness and poor planning. For example, the 1956 plan for agricultural development included the goal of building a broadcasting and telecommunications network throughout rural China within 7 to 12 years. Similarly, the 12-year plan for the development of science and technology was supposed to result in the development of systems and equipment that match the most advanced world standards. Notwithstanding these grandiose plans, by the end of 1957, China was still unable to meet the demand for long-distance telephone service between principal cities. Many of the newly constructed main lines suffered from shortages of circuits and poor connections. Intra-province services were inadequate, and new industrial centers were not provided with adequate facilities.

Great Leap Forward (1958–60)

During the Great Leap Forward, the MPT planned a massive extension and improvement of national telecommunications facilities. An important consideration in this period was the need to service mushrooming industrial construction sites. A second factor was the urgent need for improving the primitive telecommunications systems in the countryside where huge agricultural communes were being established. A third factor requiring improved telecommunications was the increasing importance of the telephone conference as the most practical device for coordinating government operations. Finally, the rapid development of foreign relations called for expansion of international communications links.

Following the successful initial 5-year plan, the government drew up a Second Five-Year Plan for 1958–62. This plan was quickly superseded by the ill-fated attempt at instantaneous industrialization known as the Great Leap Forward. Under the plan, telecommunications goals for the period included:

Laying underground cables along the principal long-distance telecommunications routes,

Installing semiautomatic and automatic telephone-telegraph exchange facilities in key communications centers,

Increasing the capacity of intracity telephone facilities,

Establishing microwave radio relay systems,

Increasing the number and power of point-to-point radio facilities.

Substantially increasing the radio broadcasting and wire diffusion networks, and

Establishing network television between major cities.

Telecommunications enterprises, according to Chinese claims, made outstanding achievements during 1958. By the end of the year, there was an increase of 72,000 kilometers of long-distance telephone lines, and more than 288,900 kilometers of hsien (county) telephone lines were set up. A total of 102,000 municipal telephones were installed, and about 120,000 square meters of floor space for production were constructed. The output of 1-, 3-, and 12-channel carrier equipment increased; 60-channel and 240-channel microwave radio relay equipment was reportedly in trial manufacture; 60-channel multiconductor cable also was trial produced; and aluminum telephone wire was used for the first time to conserve copper.

Similar achievements in telecommunications were reported in the first half of 1959. During the latter half of the year, however, there was a marked decline in such reporting. Accounts of shortages of materials and equipment began to appear in the Chinese press. The Soviet technical experts, who had been instrumental in getting the program off the ground, were summarily withdrawn in mid-1960, as a result of the widening Sino-Soviet rift. Suddenly, most of the on-going telecommunications projects came to halt in the general collapse of the Leap Forward.

Readjustment and Recovery (1961–65)

During the early 1960's, China revived its goal of a greatly expanded and more reliable telecommunications system. This goal was reflected in the expansion of the open-wire system, additional use of multichannel carrier equipment, and increasing interest in wideband telecommunications. High-capacity coaxial cable was trial produced at the

Shanghai Electrical Cable Plant. This cable was reportedly capable of transmitting both telephone and television traffic simultaneously. Without Soviet assistance, the Chinese had to rely on their own domestic capabilities.

As the economy recovered in the mid-1960's, the government was able to give greater attention to the development of the electronics industry. Complete plants to produce electronic components and prototype equipment began to be ordered from the West. Delegations of Chinese telecommunications experts toured plants and transmission facilities in Japan and Western Europe. They sought the latest technology in telephone exchange and transmission systems, coaxial and microwave carrier systems, computers, facsimile transmission equipment, and telex service.

Cultural Revolution (1966–69)

Once more, a period of political turbulence, the Cultural Revolution, put a crimp in the development of telecommunications. Imports of equipment from the non-Communist world declined, and technical exchanges were terminated.

Fourth Five-Year Plan (1971–75)

Following the winding down of the Cultural Revolution in 1969 and a transitional year, 1970, China reestablished regular economic planning. Included in the new Fourth Five-Year Plan was a massive effort to establish a modern telecommunications system to support rising economic and defense requirements. The construction program—which has proceeded with startling speed—has a priority claim on scarce resources, particularly products of the electronics industry. In the 5 years since 1969, the Chinese have constructed a nationwide network of wideband carrier telecommunications trunklines consisting of both microwave radio relay and buried cable. The new system connects Peking with most of the provincial capitals and autonomous regions. An early benefit has been the transmission of live television broadcasts from Peking to newly constructed provincial televison networks.

The government also has taken steps to improve China's international telecommunications. Three standard Intelsat ground stations were purchased from the United States in 1972 for installation at Peking and Shanghai; a nonstandard facility was imported from Japan. A coaxial cable link has been established between Canton and Hong Kong. And agreement has been reached with a Japanese consortium to lay a submarine cable link from Shanghai to Kumamoto in Japan.

Under a new policy of self-reliance, provinces and municipalities were made responsible for providing the manpower and material resources to develop local telecommunications systems. Numerous small plants were built to assemble or produce a variety of telecommunications equipment and components. Thousands of peasants were pressed into service to assist in construction of wire broadcasting and telephone transmission lines. This use of local initiative and resources has enabled China to more quickly flesh out the national telecommunications system.

III. Organization and Management

Government and defense officials share control of China's telecommunication facilities and services under the general guidance of the top Party leadership. Prime responsibility for the operation of the major portion of communications facilities rests with the Ministry of Posts and Telecommunications (MPT). Several specialized organizations have also developed communications networks to serve their specific needs, for example, the Ministry of National Defense (MND) and the Ministry of Foreign Affairs. Other special-purpose networks serve weather, shipping, and news organizations. These networks have a certain potential for common use in a national emergency, although the precise degree of interconnection has not been revealed.

The MPT is broken down geographically in typical fashion by province, special district, hsien, and municipality. Through this organizational structure, the MPT conducts day-by-day operation of the telecommunications system, trains operators and repairmen, produces and distributes equipment, and performs basic telecommunications research. The focal point is MPT headquarters at Peking. Since its establishment in 1949, the headquarters has been reorganized several times. In November 1969, the MPT was abolished, its leaders purged, and its role assumed by a joint military-civilian control named the General Telecommunications Administration (GTA), headed by Chung Fu-hsiang, a former general in the PLA Signal Corps. In mid-1973, the MPT was reestablished with Chung designated as minister.

The functional bureaus are believed to include a Main Staff Office, Long-Distance Telecommunications Bureau, Municipal Telecommunications Bureau, Confidential Communications Bureau, Capital Construction Central Bureau, International Relations Bureau, Planning and Finance Department, Accounts Department, Wage Department, Cadres Department, and Technical Department. A General Bureau of Telecommunications and a General Bureau of Postal Services have also been reported since the revival of the MPT in mid-1973.

The People's Republic of China was admitted to the International Telecommunications Union (ITU) in May 1972, following the expulsion of the Republic of China, and has subsequently taken an active role in ITU proceedings and has sent delegations to a number of ITU conferences. Peking has not yet become a member of the 84-nation International Telecommunications Satellite Organization (Intelsat), which owns and operates the Intelsat system. China is a major user of the Intelsat system, as is Taiwan, which still retains its membership. In December 1973, China also became a member of the Asian Broadcasting Union. Membership in other international telecommunication organizations will follow as the need arises, provided political considerations are not overriding.

IV. Status of Transmission Media

The telephone and telegraph system in China consist of an integrated network of common user wirelines, multiconductor and coaxial cable, point-to-point radio, and microwave radio relay. Most domestic telephone and telegraph traffic passes over the wireline network. Point-to-point radio is used for communications to remote areas, as a backup for the wireline network, and as the principal means for handling international telephone and telegraph communications. Multiconductor cable is used primarily for municipal telecommunications. Coaxial cable has only recently been deployed for use in long-distance telecommunications. A wideband microwave radio relay network is also in service and is being used for national television and facsimile transmission.

Open Wirelines

The Chinese have made substantial progress in expanding both the traffic-handling capability and the geographic coverage of the open wireline network. The network boasted more than 4 million kilometers of long-distance wire telephone lines at the end of 1974, an increase of 40 percent over 1965 and 15 times the length of the system in 1949. Main trunk routes are equipped with carrier multiplex capable of providing 12 two-way voice channels on one wire pair. Many secondary routes are equipped with a three-channel and one-channel voice carrier system. In addition, subchannel multiplexing techniques and equipment are in use on most lines to obtain from 4 to 16 telegraph circuits on one voice-grade channel.

The long-distance open wireline network in China is based on the "four-level converging radial system." The four levels are the interprovince central, the intra-province central, the interhsien central, and the intrahsien central. The interprovince central bureaus are located at most provincial capitals and major municipalities and are linked to Peking and to one another by the main wireline trunk routes. Major industrial centers, important harbors, and national defense centers are also key subscribers to the trunkline network and enjoy direct telecommunications service.

Production and installation of open-wire telephone lines continue to be given a high priority in China. More than 60 wire and cable production facilities exist, the largest in Harbin and Shanghai. Facilities at these two locations manufacture copper and aluminum telephone wire and multiconductor and coaxial cable. Together, they reportedly produce as much as 10,000 metric tons of rough-drawn wire a month. Steel and iron wire are produced in large quantities throughout China and are generally used at the local level in rural telephone and wire broadcasting networks.

Multiconductor Cable

Multiconductor cable is widely used in China's municipal telecommunications as feeder lines and, to a lesser extent, in long-distance telephone communications. Star-quad and loaded multiconductor cable links have been installed between Peking and a few provincial capitals, but high-frequency cross-talk has limited their usefulness as a suitable telecommunications medium for long-haul circuits. Most of China's multiconductor cable is produced at the Harbin and Shanghai electric cable plants.

Coaxial Cable

Until recently, coaxial telecommunications cables were not widely used in China. A 1962 reference indicates that the Shanghai Cable Plant trial produced a coaxial cable capable of providing one television channel and 3,600 telephone channels. A Soviet prototype may have been used, possibly a four-tube coaxial cable similar to that manufactured in the U.S.S.R. Since 1969, the Chinese press has made frequent references to underground cable projects. For example, in July 1973, a PLA unit was reported to have advanced its schedule for laying an underground cable in order not to hamper agriculture production. Similar reports in October 1973 suggested that the laying of multichannel coaxial cable was national in scope.

Submarine Cable

China has traditionally used domestically produced low-capacity submarine cable to connect the mainland with many of the islands located along the coast. Recently, the Chinese have turned to Japan for high-capacity 120-channel coaxial submarine cable for installation between Tientsin and Luta in the Po-hai Gulf. The purchase is apparently part of an overall plan to link major cities by underwater cable placed along the coastline and in riverbeds. China has contracted with a Japanese shipbuilder to construct a cable-laying vessel capable of handling coaxial submarine cable.

Point-to-Point Radio

The inadequacy of the wireline network in remote areas has led to the use of point-to-point radio networks for the transmission of telephone and telegraph traffic. Furthermore, when communications over the wireline network are disrupted, point-to-point radio circuits may provide the only telecommunications service available.

Microwave Radio Relay

Low-capacity (12- and 24-channel) microwave radio relay systems manufactured in Eastern Europe and the Soviet Union have been used in internal telecommunications since the late 1950's. Wideband radio relay transmission systems are currently being deployed, as part of the Fourth Five-Year Plan. The plan calls for establishing a nationwide television network to link Peking with most provincial capitals. This microwave radio relay network will eventually evolve into China's major telecommunications trunk system. Until this wideband radio relay system can be equipped with appropriate carrier multiplexing equipment, its primary use will be for television transmission.

Construction of the high-capacity microwave radio relay system has proceeded at a rapid pace. In December 1971, the Chinese reported that the October 1, 1970 National Day celebration was telecast and relayed from Peking to 15 other provinces and autonomous regions have reported receiving live television transmissions from Peking. The microwave radio relay network probably covers more than 13,000 kilometers. Signals are transmitted through more than 260 microwave repeater and terminal stations, assuming that the stations are spaced at a standard distance of 50 kilometers.

The microwave radio relay system probably provides the Chinese with a potential capacity of 600 to 960 channels of telephone traffic per active radio frequency (RF) trunk channel. Because as many as five

RF trunk channels per route are common, such a microwave system potentially can carry close to 5,000 telephone channels. Any of the trunk channels can serve alternatively to carry television.

Telecommunications Media in Prospect

Although construction of a new wideband high-capacity system is far from complete, China probably will advance into other areas of modern telecommunications technology. Tropospheric scatter research has apparently been under way since 1964. An article in a Chinese journal in 1964 reflected knowledge of tropospheric scatter theory equivalent to the U.S. state of the art at that time. The Chinese also have shown an interest in low-capacity pulse code modulation (PCM). Because China is in an early stage of deploying a wideband communications system, 24-channel PCM equipment would reduce the cost of installing short-haul toll circuits or in adding local junction cable or conduits in large cities. A domestic satellite communications network also can be expected. The Chinese have been actively seeking test instrumentation used in ground station operations. A Chinese scientist who visited the United States in 1973 indicated that research was being conducted on a communications satellite. Laser and millimeter wave-guide research is under way in China and could have applications suitable for telecommunications transmission.

Carrier Multiplex Equipment

As with most countries, the Chinese have standardized 12-channel and 3-channel carrier multiplex systems on open wirelines. If used in combination, these systems will provide a total of 16 voice channels—including baseband—on one wire pair. The most often referenced telephone multiplex equipment for open wirelines is the ZB 312 series. ZB 312–IV-type 12-channel group carrier equipment was first produced in 1964 at the Shanghai Posts and Telecommunications Equipment Plant. A ZB–316-type telegraph multiplexer was also manufactured at the same facility and is used to obtain 16 telegraph channels on a single voice-grade circuit. Transistorized versions of this equipment are now being manufactured in China.

Despite the progress the Chinese have made in developing wideband transmission, the systems cannot operate at designed capacity unless adequate multiplexing equipment is available. Except for a limited amount of time division multiplexing equipment, most carrier-equipped telephone channels in China employ the technique of frequency division multiplexing (FDM). In 1958, a 24-channel carrier FDM system was reportedly trial produced at the Peking Telecommunications Scientific Research Institute. The following year, the Chinese announced the trial manufacture of a 60-channel FDM carrier system. Serial production of 60-channel FDM supergroup equipment was apparently not begun until 1971.

Telephone Switching

Telephone switching in China is accomplished through a network of regional branch offices located at various administrative levels. At

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present, there are about 3,000 local and toll telephone exchange offices in the cities. Lower level telephone exchanges offices are estimated to number at least 40,000.

There are about 5 million automatic lines in China, including poor-quality private automatic exchange lines. The majority of these lines are used in antiquated step-by-step exchanges, with only a small percentage of common-control crossbar switching equipment. Obsolete Soviet and East European technology is used in Chinese-manufactured exchanges, most of which have a capacity of about 200 to 900 lines. In addition, China operates a large number of magneto-type manual exchanges in small cities and rural areas.

Modern telephone switching equipment is essential for efficient utilization of China's newly acquired high-capacity telecommunications transmission networks. China also is faced with a growing demand for external telephone communications because of rapid expansion of foreign economic and diplomatic activities. In addition, growing requirements for communcations by the armed forces are in competition with civil requirements for use of local and toll switching facilities. In order to develop its growing subscriber communications, China must revamp much of the available switching capacity.

The government recognizes the limitations of its telephone switching system and, since 1971, has sponsored the study of technology available in the non-Communist world. A thorough evaluation is called for because the type of switching equipment used dictates what other equipment can subsequently be added to the system. Chinese interest in Western equipment and manufacturing facilities covers a variety of electromechanical and electronic exchanges. The Chinese apparently have not decided whether to go with crossbar or opt for the more sophisticated electronic switching equipment. On the basis of previous practice, the Chinese will probably import enough switching equipment to meet most current needs and will satisfy future requirements by importing a complete manufacturing facility.

V. Telecommunication Modes and Services

Telephone and telegraph communications, including manual Morse, automatic Morse, teleprinter, and facsimile are China's principal modes of telecommunication. Telecommunications service ranges from poor to good. Local service is generally poor. Long-distance service is rapidly improving with the recent addition of modern transmission systems. Further improvement is expected with the installation of advanced switching equipment. In almost all provinces and municipalities, an effort is now underway to expand available telephone and telegraph service.

Telephone

Local and interurban telephone service is the major telecomunications service available in China. The system, with approximately 1 million telephone outlets, ranks low compared with the systems in other large LDC's. Nonetheless, the system meets the basic needs of the state, industry, and the armed forces. Even the minimal needs of agriculture are now being met because of the quadrupling of rural telephone outlets in the last decade. More than 98 percent of the nation's communes now have telephone service.

Approximately 80 percent of the nation's cities are now equipped with automatic dial systems. The telephone numbering system reflects an expansion of urban services. Shanghai converted from a 5- to a 6-digit number system in 1957; Peking in 1965. The capital now has about 170,000 telephones. Eleven other major cities use a 5-digit numbering system, and a 4-digit system. Direct dialing service started in October 1969 between Peking and Tientsin. This is the only known long-distance dialing service available in China.

Telephones are installed on a priority basis according to the needs of Party, military, government, industrial, and commune officials. Some hotel rooms in large cities have telephones that can be connected into the local telephone system. An increasing number of public pay telephone booths are being installed in the larger cities—in public parks, post offices, and shops, and on the main streets. Only highranking officials have phones in their private residences.

A common feature of the telephone service in China is the telephone conference call. The extensive bureaucratic organization of Chinese society requires a multitude of meetings to exchange information, pass on instructions, spur lagging production, and coordinate papers. Because China has few resources to spare, telephone conferences are used in preference to time-consuming and costly gatherings.

Telegraph

The telegraph system has played second fiddle to the telephone system. The wireline and point-to-point radio networks have provided only a small capacity, made even smaller by the use of Morse transmissions over most of the circuits. In addition, telegraph operation is hampered by the complex nature of the written Chinese language. To overcome this problem, the Chinese have adopted a numerical 4-digit code, a time-consuming procedure involving both manual encoding and decoding of the transmitted message.

With the exception of some recently imported West German teleprinters, most of the telegraph transmission equipment in China is obsolete. The most widely used teletype machines are the model 68, the model 51, and the model 55. The model 68, a tape-perforating teletype unit manufactured by Siemens of West Germany, was initially imported in 1957. The model 51 was first imported from East Germany in 1955. The model 55 is manufactured in China and is an adaption of various types of foreign equipment.

A major breakthrough in China's telegraph service was achieved in 1969 with the trial production of an electrostatic telegraph printer. The printer is equipped with a memory storage device and is able to automatically convert a punched tape of 4-digit telegraphic code directly into Chinese character text. The machine operates at a speed of 1,500 characters a minute, 75 times the speed of manual decoding. In addition, the Chinese announced in November 1974 the production of their first electronic telegraph relaying machine.

Facsimile

The introduction of facsimile telegraph service is another attempt by China to overcome the language problem in telegraph transmission. Facsimile equipment allows the direct transmission of character text, copies of drawings, photographs, and newspaper items. During the First Five-Year Plan, radio and wire facsimile service became available on many domestic and international telegraph circuits, using mainly foreign-produced equipment. By September 1957, direct facsimile service was available between Peking and Shanghai, Canton, Wu-han, Moscow, Berlin, Warsaw, New Delhi, and Stockholm.

Chinese development of low-speed facsimile equipment began in 1955. On April 21, 1956, the Chinese announced that facsimile telegraph equipment for transmitting Chinese characters was successfully completed in Chungking. Several months later, the Peking Telegraph Bureau was reported to be doing research on a simplified type of black-and-white facsimile machine. Further data on facsimile transmission appeared in July 1958, when the Peking Long Distance Telecommunications Bureau announced the successful trial production of a telefacsimile machine capable of transmitting a full page of the People's Daily. Subsequently, the Chinese announced the development of several simplified facsimile machines, the model 58-1, the 58-2, and the 58-3, for use in the rural areas. A facsimile telegraph machine for color transmission was also trial produced in 1958.

In 1969, the Chinese announced the trial production of a new type of facsimile transceiver. Described as the Tung Fang Hung No. 1 Model, the facsimile machine was reportedly capable of transmitting a complete page of newsprint in 24 minutes. Possibly an improved version of equipment that was initially designed in 1958, the facsimile transceiver was used on October 1, 1969 for transmission of the People's Daily to China's remote provinces and autonomous regions. In 1972, the Chinese announced development of the Tung Fang Hung No. 2 Model, a new high-speed facsimile transceiver capable of transmitting a full page of newsprint in 3.7 minutes.

Facsimile equipment still is not produced on a large scale, and China continues to rely heavily on foreign suppliers. A Japanese firm recently received a large order from China for a newspaper facsimile system which uses a laser beam for color printing.

Telex

Telex service in China has only recently become an important mode of telegraphic communciations. Unlike normal telegraph, telex is a service that enables users to communicate directly with one another by means of a standard teleprinter. China's telex service is limited to international communications and is available only to government and press agencies. The service probably will continue to expand, and trading firms outside of China will be able to use the system.

VI. International Telecommunications

Political and economic developments over the past several years have created a need for the People's Republic to improve and expand its international telecommunications facilities. Following the admission of China to the United Nations in 1971, many countries swiftly established diplomatic relations with Peking. China now has diplomatic representation in 90 countries—compared with only 45 in 1969—and is playing a much more active role in international organizations.

Since the Cultural Revolution, the volume of foreign trade has risen sharply, as China seeks additional machinery and technology and is willing to buy a certain amount on credit. Experts in the Japanese and U.S. communications industries predict that telephone traffic with their countries will grow from 35,000 messages in 1973 to 775,000 messages in 1980.

Until early 1972, China gave low priority to the development of international telecommunications. High frequency (HF) point-to-point radio and open wirelines handled most of China's international traffic; the remainder was carried by multiconductor cable or low-capacity microwave radio relay. While almost all of China's international circuits provided some form of telegraph service, less than half provided telephone service. A still smaller number of circuits were equipped with facsimile service. Telex service was available to only a small number of overseas terminals, and no facilities were available for relaying television between China and other countries.

Before 1972, the traffic-handling capability of China's international telecommunications facilities fell considerably short of national requirements. None of the international wireline circuits was capable of providing more than 2-way voice channels on a single wirepair, the majority being equipped with single-channel voice carrier which allows submultiplexers for telegraph. A multichannel capability was available on the Harbin-P'yongyang cable, which had been installed during the Japanese occupation of Manchuria. International HF raidotelephone circuits were seldom used to provide more than a single voice-grade channel. China's highest capacity international link was a 12-channel microwave radio relay system between Canton and Hong Kong, installed in the early 1950's.

Prior to 1972, the radio communciations facilities of the MPT were hard pressed to meet expanding requirements. Most Chinese international HF transmitting and receiving stations were capable of using single sideband, independent sideband, and voice frequency multiplexing for Morse, radiotelephone, radio-printer, and facsimile transmission. The equipment, however, was substandard, a mixture of obsolete foreign equipment and simple telecommunciation devices manufactured domestically. The resulting lack of both quality control and uniform equipment standards created maintenance problems, led to early replacement of equipment, and complicated the orderly expansion of China's international communications facilities.

Continued operation of China's international radio communications had been supported by drawing heavily on Western countries for equipment. Although the Chinese produce their own long-distance HF transmitters and receivers, they must import much of the ancillary equipment commonly used in international telephone and telegraph service. They have succeeded in producing copies of some imported equipment, including automatic error correction (ARQ), voice frequency telegraph (VFT), voice-operated device antisinging equipment (VODAS), teleprinters, facsimile equipment, and telephone switchboards.

The reliability of international radio communications frequently was impaired by the sensitivity of HF transmission to atmospheric interference and weather disturbances. In general, conditions in early 1972 were ripe for a large-scale program to renovate and expand China's entire international communciations system.

Satellite Communications

China acquired its first modern wideband international telecommunications facility at the time of President Nixon's visit in February 1972. Temporary earth stations capable of transmitting voice and television from China to the world were established at Shanghai and Peking by U.S. engineers. The Peking station was removed at the end of the President's visit; the station at Shanghai, which was purchased by China, was refitted with a standard 30-meter antenna and additional circuits by RCA. The Shanghai station has been carrying China's traffic with the Western Hemisphere via the Pacific Intelsat since August 1973. It now furnishes 60 telephone channels plus 1 television channel and can be expanded to 120 channels.

Since early 1972, China has imported four Earth stations for international communications by satellite. The Peking No. 1 station is linked to the Pacific Ocean satellite. The Peking No. 2 station is linked with the Indian Ocean satellite, replacing a nonstandard Japanese-made portable station. China's satellite Earth stations were providing 36 high-quality voice circuits to 13 countries in June 1974 and will probably provide service to many more by the end of 1975.

New Cable Facilities

In February 1973, China signed an agreement with Hong Kong Cable and Wireless, Ltd. to construct a 180-kilometer buried coaxial cable line between Hong Kong and Canton. This system, valued at about $1 million, went into operation in early 1974. The cable system can provide 300 high-quality 2-way telephone channels suitable for transmission of telegraph, telex, data, facsimile, and voice communications. The initial capacity of the system will be 60 voice channels, with provision for expansion at a later date. The cable will replace an antiquated, low-capacity microwave radio relay link.

In May 1973, China and Japan agreed to install an 850-kilometer coaxial submarine cable across the South China Sea, linking Nan-hui, near Shanghai, with Japan at Kumamoto on Kyushu. The cable could eventually carry China's traffic with other nations through switching centers in Japan linked to the international submarine cable system.

This new cable will be capable of carrying 480 high-quality 2-way telephone channels with provision for submultiplexing telegraph, telex, data, facsimile, and radio broadcast traffic. It will take 3 years to install. The $24 million tab will be shared equally by the two countries.

Cable links with Hong Kong and Japan will provide access to the trans-Pacific submarine cable network. This network is unusually reliable and provides large numbers of high-quality circuits. Japan is tied into two major routes in the Pacific area system, including the Japan-U.S.S.R. coaxial submarine cable and Transpac I, the Honolulu-Manila submarine cable link. Hong Kong is tied into the Southeast Asia cable SEACOM, which connects with Guam, Indonesia, Australia, East Malaysia, and Singapore.

Radio Telephone (HF Systems)

Despite China's determination to rely primarily on satellite and coaxial submarine cable systems for international communications, high-frequency radio will continue to play a vital role. Direct radio telephone service is available to Australia, Austria, Canada, Ethiopia, France, Hong Kong, Italy, New Zealand, the United Kingdom and the United States. Not only is HF radio a useful back-up system for areas that are regularly connected by satellite or cable but it also provides an economical means for communicating with areas of low traffic volume. The quality of China's radio telephone circuits has been substantially improved through the purchase of Western equipment.

Transit Switching Service

In addition to using HF radio, China can reach countries with which it does not have direct wideband satellite and cable connections by using the transit switching services available in all advanced countries. Transit service is usually a temporary expedient employed by countries at an early stage of development. The system provides alternative communications routes when outages occur in direct circuits.

VII. Broadcasting System

The broadcasting system of the Peoples Republic is composed of radio, television, and wire broadcast facilities. Broadcasting policy conforms to general Maoist prescriptions for shaping the new Chinese man, with emphasis on collective techniques. Radio broadcasting stations are regarded as lecture rooms capable of teaching millions of people at the same time. The Peking Central People's Broadcasting Station forms the core of the radio broadcasting network. Local people's broadcasting stations have been established in the provinces, cities, and autonomous regions. Television broadcasts include speeches, revolutionary operas, and public events to underscore the unity of China under Mao and to provide guidance on the latest political and economic campaigns. All capitals of the 29 province-level units, except Lasa and Urumchi, receive telecasts from the Peking Television Broadcasting Station via a nationwide network of microwave radio relay facilities. The wire diffusion network provides a form of controlled broadcasting by which radio programs are relayed through wire diffusion centers to loudspeakers installed throughout the vast rural areas.

Radio

Radio facilities have developed from a single station in 1945 to more than 150 stations today. The power of radio transmitters has steadily increased. Imports of high-powered transmitters, supplemented by domestic production, led to an expansion in total power to 2,200 kilowatts by the end of 1956. The current power output probably exceeds 5 megawatts.

The most important station in the country is the Central People's Broadcasting Station in Peking. This station uses at least 25 shortwave transmitters and approximately 35 medium wave transmitters for domestic service broadcasts. Domestic programs are received by local amplitude modulation (AM) stations and are then rebroadcast. Only two frequency modulation (FM) stations are operating in China—one in Peking, the other in Shanghai.

China uses approximately 62 shortwave transmitters for its international service broadcasts, most located near Peking. This total does not include a number of national, provincial, and regional service transmitters that relay or rebroadcast certain international service programs. At least four transmitters at Tirana in Albania—three shortwave and one medium wave—relay and rebroadcast programs to Europe, Africa, and the Americas.

Radio receiver production has expanded from 1 million units in 1968 to 12 million units in 1974 (see table 1). Increased production is the result of expanded output at existing radio manufacturing facilities in old industrial centers and of output at new facilities in outlying areas. The majority of the receivers now produced in China are transistorized.

Television

China conducted its first experimental television broadcast in 1957 with Soviet assistance. In 1958, as part of the ill-fated Great Leap Forward, Peking announced a 4-year plan to establish a national television system with broadcasting stations in more than 30 cities. This highly propagandized effort was a flop. By the end of 1962, only 12 cities had broadcasting stations and these suffered from breakdowns attributable to equipment failures and shortages of spare parts.

TABLE 1.—*China: Production of radio receivers*

[In thousands of units]

Year:	*Output*	Year—Continued	*Output*
1952	[1] 17	1964	[11] 1,000
1953	[2] 25	1965	[11] 1,000
1954	[3] 28	1966	[11] 1,000
1955	[4] 151	1967	[11] 1,000
1956	[5] 270	1968	[11] 1,000
1957	[6] 390	1969	[10] 1,000
1958	[7] 1,200	1970	[12] 3,800
1959	[8] 1,560	1971	[13] 4,000
1960	[9] 1,500	1972	[14] 4,480
1961	[10] 1,250	1973	[15] 8,064
1962	[11] 1,000	1974	[10] 12,000
1963	[11] 1,000		

[1] Kang Chao, *The Rate and Pattern of Industrial Growth in China*, Ann Arbor, University of Michigan, Press, 1965, pp. 123–129.
[2] Derived from a report that production in 1960 was 60 times that of 1953. New China News Agency (NCNA), Nov. 8, 1961.
[3] Production was reported as approximately 28,500 units in 1954. *Kung Jen Jih Pao*, June 16, 1958.
[4] Production in 1956 was reported to have increased 79 percent over that of 1955. FBIS No. 47, Mar. 11, 1957, p. BBB 2.
[5] China announced production of 120,500 more radios in 1957 than in 1956.
[6] Annual output was announced as 390,000 units. NCNA, Nov. 8, 1961.
[7] Annual output was announced as 1.2 million units. NCNA, Nov. 9, 1959.
[8] Production at the end of 1959 was slated to be four times that at the end of the First Five-Year Plan (1957). Wu-hsien-tien No. 2, 1960.
[9] Production for 1960 was announced as 1.5 million units. NCNA, Nov. 8, 1961.
[10] Estimated.
[11] Estimate based on Rawski's data and announcements by individual plants.
[12] Sales of transistor radios were announced to have increased by 280 percent over those of 1969. Transistor sets are assumed to represent 95 percent of production and output of tube sets to be 5 percent. NCNA, Dec. 30, 1970.
[13] Output in 1971 was announced to be four times that of 1965.
[14] Output was announced to have increased 12 percent over that of 1971. Peking Radio, July 22, 1973.
[15] Production was announced to have increased 80 percent over that of 1972. NCNA, Aug. 16, 1973.

In the subsequent period of readjustment and recovery, China strengthened its domestic capability for producing television broadcasting and receiving equipment by imports from Japan and Western Europe. By the end of 1969, China had 15 broadcasting stations. Only four—Peking, Shanghai, Tientsin, and Canton—were equipped with studios for live programing. Programs produced in Peking were broadcast by other stations from movie film because there were no telecommunications links between stations. The major accomplishments of the post-Leap period were the building up of China's domestic competence in the production of television equipment and the gradual technical improvement of existing broadcasting stations.

Since 1969, China has forged ahead with its plans for a national television network. All provincial capitals, except Lhasa, and many other major cities now have broadcasting stations (see table 2).

The Chinese television network is used primarily to carry live programs from Peking. At present, only stations in Peking, Shanghai, Canton, and less likely, Tientsin, are believed to be capable of transmitting programs to other stations through wideband microwave radio relay channels. The press has mentioned the use of both coaxial cable and microwave radio relay to carry television broadcasts from Peking to outlying provinces. Most links probably are microwave radio relay.

TABLE 2.—CHINA: PRINCIPAL TELEVISION STATIONS AS OF DECEMBER 1974 [1]

Location	Province	Date commissioned
Canton	Kwangtung	1958
Peking	Peking municipality	1958
Tai-yuan	Shansi	1958
Ha-erh-pin	Heilungkiang	1959
Shanghai	Shanghai municipality	1959
Ch'ang-ch'un	Kirin	1960
Hangchow	Chekiang	1960
Man-ch'ing	Kiangsu	1960
Shen-yang	Liaoning	1960
Tientsin	Tientsin municipality	1960
Wu-han	Hupeh	1960
Fu-chou	Fukien	1961
Sian	Shensi	1965
K'un-ming	Yunnan	1969
Tsian	Shantung	1969
Cheng-chou	Honan	1970
Ch'eng-tu	Szechwan	1970
Ch'ung-ch'ing	do	1970
Hofei	Anhwei	1970
Hu-ho-hao-t'e	Inner Mongolia AR	1970
Kuei-yang	Kweichow	1970
Lan-chou	Kansu	1970
Nan-ning	Kwangsi Chuang AR	1970
Shih-chia-chuang	Hopeh	1970
Urumchi	Sinkiang Uighur AR	1970
Ch'ang-sha	Hunan	1971
Hsi-ning	Tsinghai	1971
Nan-ch'ang	Kiangsi	1971
Tsingtao	Shantung	1971
Yin-ch'uan	Ningsia AR	1971

[1] All except Urumchi are capable of broadcasting live programs from Peking and of originating their own live programs for local broadcasting. In addition to Peking, only 3 other stations—Shanghai, Canton, and less likely, Tientsin—are believed to be capable of transmitting their live programs to other stations.

To reach the wide audience desired by the leadership, television reception must be extended beyond the transmitter range of the main provincial station. Thus, numerous rebroadcasting stations have already been built to retransmit television signals into outlying areas. Peking broadcasts to Szechwan, for example, were reported to be received in Nan-ch'ung, Mien-yang, Lo-shan, Ya-an, I-pin, and the Ta'hsien and Nei-chiang Special Districts as well as in Ch'eng-tu, Ch'ung-ch'ing, and the Wen-chinag Special District. This claim implies that in addition to the provincial studios in Ch'eng-tu, a number of other broadcasting or rebroadcasting stations in the province can transmit programs that originate either in Ch'eng-tu or Peking.

As the program for constructing television broadcast and rebroadcast stations progressed, the potential viewing audience expanded. By 1974, production of television receivers in China had increased to 115,000 sets, compared with 10,000 units in 1969 (see table 3). Increased production was achieved by expanding output at existing facilities and by constructing new production facilities in the provinces. Television receivers are now produced in a variety of sizes, including a 9-inch transistorized model.

China has some 300,000 television receivers. Practically none are owned by individuals. They are installed in public meeting places, communes, industrial plants, military units, and schools. Typically, 100 or more persons crowd in front of a black-and-white television set. High government officials and model workers are beginning to get sets, so far on a small scale.

TABLE 3.—CHINA: PRODUCTION OF TELEVISION RECEIVERS

Year	Annual output	Cumulative, yearend
1960		[1] 20,000
1961	2,000	22,000
1962	3,000	25,000
1963	3,000	28,000
1964	5,000	33,000
1965	5,000	38,000
1966	8,000	46,000
1967	5,000	51,000
1968	5,000	56,000
1969	10,000	66,000
1970	15,000	81,000
1971	[2] 20,000	[2] 101,000
1972	[3] 40,000	141,000
1973	[4] 75,000	216,900
1974	[5] 115,000	331,000

[1] A total of 20,000 television receivers reportedly were in use throughout the country Ta Kung Pao, Hong Kong, Sept. 4, 1960. Until 1960–61, China imported most of its television receivers; since then increases represent domestic production.

[2] A report claimed that 100,000 television receivers were in use South China Morning Post, Hong Kong, Nov. 29, 1972.

[3] Production in 1972 reportedly increased 100 percent over that of 1971. NCNA, July 22, 1973

[4] Production in the 1st months of 1973 reportedly was 88 8 percent higher than in the corresponding period of 1972. NCNA, Aug. 16, 1973. This rate was assumed to have prevailed for the entire year Fragmentary reports on production trends in major television plants suggest that between 50,000 and 100,000 television receivers were produced in 1973.

[5] Television cathode ray tubes manufactured in China are apparently still produced with Soviet-supplied equipment, which had a design capacity for producing 150,000 tubes a year. Pravda, Sept. 11, 1957; Pravda, Sept. 2, 1959; Vechernyaya Moskva, Sept. 5, 1957. Assuming a 25-percent reject rate in the manufacture of TV picture tubes (150,000 ÷ 4), maximum output in 1974 would be approximately 115,000 units. Vechernyaya Moskva, Aug. 12, 1955 Future increases in output will probably be obtained largely through the manufacture of color sets; current production is less than 5,000.

China appears ready to move into color television, even though development of black-and-white television has a long way to go. After months of study of transmitting and receiving systems in Japan, France, West Germany, and the United States, the Chinese seem ready to negotiate large purchases of equipment and technology. Interest in Western equipment and manufacturing facilities covers the whole range of the color television process, from alternative color transmission systems to receivers, picture tubes, studio equipment, and related manufacturing equipment and technology.

While China has not yet committed itself to a particular color broadcasting system, evidence suggests that it favors the PAL system of AEG-Telefunken in West Germany. Within the past 2 years, Peking has imported more than $2 million worth of color television studio equipment incorporating PAL technology. In May 1973, trial color broadcasts were begun at the Peking Television Station using the PAL process. Similar trial broadcasts are reportedly planned at the Shanghai and Canton television stations.

Wired Broadcasting

China appears close to completing a national wired broadcasting network that will provide a direct radio link between Peking and the heavily populated rural areas. Development of the network fills a major gap in China's domestic communications system. As shown in table 4, an estimated 140 million loudspeakers have been deployed. They provide direct broadcasting to approximately 90 percent of the production brigades and teams and to about 65 percent of the rural households.

TABLE 4.—CHINA: PRODUCTION OF LOUDSPEAKERS [1]

[In thousands of units]

Year	Annual output	Cumulative
1969		22,350
1970	19,380	41,730
1971	21,340	63,070
1972	23,940	87,010
1973	29,560	116,570
1974	24,740	141,310

[1] The principal sources used in preparing this table are official Chinese newspapers, newscasts, and journals relating to individual provincial achievements in developing the wired broadcasting network.

Domestic radio broadcasts serve only the more heavily populated urban areas in China and do not reach the immense numbers of peasants and minority groups. The new wired network, or radio diffusion system, normally operates at the county level, beginning with the county broadcasting station. From here, commune relay stations, production brigades, production teams, and individual commune households enter the network.

The wired broadcasting system was initially developed during the Leap Forward. After a period of neglect, a new expansion program started in 1965 but did not gain real momentum until after the Cultural Revolution. Since 1969, China's efforts to expand wired broadcasting have been impressive. Much of the power is provided by 50,000 small-scale hydroelectric power stations that have been built in the countryside. Thousands of peasants were pressed into service to construct and maintain special wire broadcasting lines. In many areas, small electronic manufacturing facilities were created to produce loudspeakers and more sophisticated receiving and amplifying equipment.

Appendix

Glossary

Amplitude modulation (*AM*): The process by which a selected carrier frequency is varied in magnitude (amplitude) by a signal that contains the information to be transmitted in telecommunications. (See *Frequency modulation.*)

Apparatus: Instruments, machines, appliances, and other assemblies used in providing a telecommunications facility.

Automatic (as an adjective): Of or pertaining to any process involved in producing telecommunications service that does not require direct, immediate human assistance.

Band (of frequencies): The entire range of frequencies between two numerically specified frequency limits. The magnitude of this range is a limiting factor on the amount of information that can be transmitted in telecommunications. With respect to frequencies of the radio spectrum as a whole, the International Telecommunication Union has for convenience divided the whole radio spectrum into eight major bands, as follows:

Frequency bands		Corresponding wave band
Range	Type	
Up to 29 kHz[1]	Very low frequencies (VLF)	Myriametric waves.
30 to 299 kHz	Low frequencies (LF)	Kilometric waves.
300 to 2,999 kHz	Medium frequencies	Hectrometric waves.
3,000 to 29,999 kHz	High frequencies (HF)	Decametric waves.
30,000 kHz to 299 MHz[2]	Very-high frequencies (VHF)	Metric waves.
300 to 2,999 MHz	Ultra high frequencies (UHF)	Decimetric waves.[3]
3,000 to 29,000 MHz	Super high frequencies (SHF)	Centimetric waves.[3]
30,000 to 299,000 MHz	Extremely high frequencies (EHF)	Millimetric waves.[3]

[1] Kilohertz per second, or 1,000 hertz per second.
[2] Megahertz per second, or 1 million hertz per second.
[3] It is becoming common usage to refer to waves (frequencies) in these 3 bands as microwaves.

Cable: Two or more sheathed, insulated metallic conductors used as a telecommunications medium. Cable can consist of a single pair of conductors, more than one pair (multiconductor), or be of coaxial construction.

Carrier system: A method of transmitting electrical information by modulating it onto a higher frequency carrier wave, then at the receiving end recovering the original information by demodulation. Useful because many telephone channels can be modulated on one carrier wave and carried on a single transmission path.

Channel: A portion, electrical or physical, of a telecommunications circuit, line, supergroup, or group that can be used to transmit information independently of and simultaneously with all other portions. A channel may be used to provide two or more subchannels (see Subchannels).

Coaxial: Of or pertaining to a modern telecommunications cable medium technique using one or more tubes. Each metal tube surrounds a conducting wire supported concentrically by insulators. The space in the tube usually contains nitrogen gas under pressure. Generally, coaxial cable is used for the transmission of relatively large amounts of information. A single tube usually carries information in only one direction at a time. The capacity of a tube depends in part on the distance between repeater stations. Modern coaxial cable systems consist of one tube for submarine applications, or from 2 to 20 for overland communications, with individual capacities per tube of 60 to 10,800 channels.

Electronics: An association of apparatus, material, and electrical energy required to furnish telecommunications service.

Facsimile (as an adjective): Of or pertaining to a telecommunications (telegraph) service in which photographs, drawings, handwriting, and printed matter are transmitted for graphically recorded reception. In one method (type A), images are built up of lines or dots of constant intensity. In another method (type B), images are built up of lines or dots of varying intensity, sometimes referred to as "telephoto" and "photoradio."

Feeder (as an adjective): Of or pertaining to telecommunications facilities of relatively low capacity that join facilities of relatively high capacity. (See *Main.*)

Frequency: The rate in cycles per second at which an electric current, voltage, wave, or field alternates in amplitude. (See *Band.*)

Frequency modulation (*FM*): The process by which a selected carrier frequency is varied in frequency by a signal that contains the information to be transmitted in telecommunications. (See *Amplitude modulation.*)

Line: A general term used to delineate a telecommunications circuit facility (wire, cable, or radio).

Main (as an adjective): Of or pertaining to telecommunications facilities at and between principal cities and centers that have relatively high capacity compared with feeder facilities. (See *Feeder.*)

Medium: Any substance or space that can be used practically to transmit a form of electrical energy for the purpose of providing telecommunications service.

Microwave radio relay (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications employing radio frequencies higher than 300 MHz. These frequencies normally do not afford practical direct transmission to great distances, because they travel in a straight line and do not follow the earth's surface. They are, however, capable of reliable transmission from horizon to horizon (line-of-sight) by the use of special antennas that concentrate the radio energy and give it desired direction. In consequence, great distances can be reached by this technique by the interposition of relay stations along the route of the line with a spacing interval of about 50 kilometers, depending on terrain conditions. This technique can be employed practically to carry from a small number of telephone channels and telegraph subchannels to thousands of such channels and subchannels and to carry one of or more television and other specialized circuits. (See *Band.*)

Modulation: The process of altering a carrier frequency of pulse train by other frequencies or pulses representing the information being transmitted.

Multiplex (as an adjective): Of or pertaining to the combining of information signals of two or more RF trunks, supergroups, groups, channels, or subchannels for transmission over the same circuit.

Network: An interconnection, electrical or physical, of two or more circuits or portions thereof for the purpose of facilitating telecommunications service.

Point-to-point (as an adjective): Of or pertaining to telecommunications service between fixed points, using the radio medium-excluding microwave and scatter communications.

Portable (as an adjective): Belonging to or concerning an individual person, organization, institution, or activity; not public or common.

Pulse: A spurt of electrical energy of extremely short duration (usually measured in millionths of a second) yet capable of being used in telecommunications to transmit information.

Quad: In a multiconductor telecommunications cable, the physical association of a group of four conductors in any one of various arrangements for the purpose of providing 2-way multichannel operation.

Route: The geographical path followed by a wire, cable, or radio line.

Scatter (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications by which energy in radio frequencies above 30 MHz is deliberately beamed at one or the other of two reflecting portions of the atmosphere (troposphere and ionosphere) at such a predetermined angle that a usable portion of the energy arrives at the desired receiving location. This technique is especially applicable to regions in high latitudes (Arctic and Antarctic) where facilities of other media suffer from the rigors of weather and terrain and where the conventional long-distance radio media of the lower frequency hands (200 kc to 30 mc) are subject to serious disruptive propagational anomalies. (See *Band.*)

Subchannel: A portion, electrical or physical, of a telecommunications channel that can be used independently of and simultaneously with all other portions. An appreciable number of telephone channels usually can be subchanneled to carry from 3 to 20 60-word-per-minute teletype subchannels on each telephone channel so employed.

Subscriber: A number of groups (often five) combined (multiplexes) electrically in building up the total capacity of a telecommunications circuit or RF trunk.

System: All of the facilities and networks managed by a single agency, organization, company, department, committee, ministry, or other entity in rendering either functional or basic telecommunications service.

Telecommunications: Transmission, reception, or exchange of information between distant points by electrical energy over a wire, cable, or radio medium facility to produce telephone, telegraph, facsimile, broadcast (aural and visual), and other similar services.

Teletype (as an adjective): If or pertaining to a technique for effecting telegraph service by the use of an apparatus similar to a typewriter in which information is transmitted by keyboard, and received by type printer on a roll of paper or tape or by perforations on a roll of tape or both. The apparatus is sometimes called a "teleprinter" or a "teletypewriter."

Transmission base: The aggregate telecommunications transmitting facilities employed in providing broadcast service.

Transistor: A modern device that is capable of performing in a solid (germanium or silicon) many of the functions performed by the conventional electronic tube in a gas or vacuum.

Troposphere: The layer of the Earth's atmosphere occupying the space from the Earth's surface to a height of about 6 statute miles. This layer is used as a scattering reflector for tropospheric scatter-transmission techniques to distances of about 200 to 500 statute miles.

Wave guide (as an adjective): Of or pertaining to a telecommunitions medium, now under development in several countries, that may be capable of transmitting extremely large amounts of conventional and complex information. It consists of a circular or rectangular hollow metallic tube in which electrical energy travels in the form of waves, much as do sound waves in a speaking tube.

Wire diffusion: Distribution of broadcast programs by a wire or cable medium to wired loudspeakers.

Wired loudspeaker: A telecommunications loudspeaker that receives from a distribution point one or more broadcast programs by a wire or cable medium.

Wireline: A general term used to identify a line consisting of either an aerial cable (and/or separate wires) or an underground cable used as a telecommunications medium.

CONSTRUCTION TRENDS IN CHINA, 1949–74

By Ian H. MacFarlane

CONTENTS

Tables

Introduction

A comprehensive index of construction activity should employ estimates for the entire output of the construction sector or for all inputs to the constructor sector (building materials, labor, and transportation). In the case of the Peoples Republic of China, gaps and deficiencies in the available data do not permit the calculation of either type of construction index. However, an index can be calculated from the information available on inputs of major building materials. The resulting index is believed to represent correctly the general trends in activity of the organized construction sector.

Definition of Construction

The term "construction" as used in this paper refers to activity that results in additions to productive capacity under the economic plans of major political entities. Rural construction, which is not included in the index, is construction undertaken and funded by smaller units in the countryside, primarily communes, production brigades, production teams, and households. Rural construction sometimes uses labor assigned on a regular basis from the production teams: the laborers receive credit in the form of work points that are the basis of the year-end distribution of the collective's income. In other cases, unpaid labor is extracted from the members of the economic unit involved. Rural construction consists mainly of repair and construction of farm buildings, small-scale irrigation and water conservancy works, and small industrial facilities of various types. Households are especially important in contributing to the building, expansion, and maintenance of dwelling units, normally on an afterhours basis, with the use of local materials. Funds accumulated for rural construction activity are small on a project-by-project accounting but large in the aggregate.

Organization of the Construction Industry

The responsibility for construction in China is diffused among numerous governmental organizations. The lines of authority cross regional and functional boundaries, and there is much overlapping of responsibility. Reorganizations of the control structure have occurred at the highest level. The State Capital Construction Commission was abolished in 1961 and merged with the State Planning Commission. In 1965, a second reorganization took place when the Construction Commission was reestablished and the Ministry of Construction was divided into the Ministry of Construction and the Ministry of Construction Materials. In 1971–72, the two were again combined as the Ministry of Construction to enhance coordination between the planning of construction and the availability of construction materials. The National Peoples Congress in January 1975 reaffirmed the existence of the State Capital Construction Commission; the reports of the Congress unaccountably did not list either a Ministry of Construction or a Ministry of Building Materials.

The actual construction of large, modern industrial plants is performed by the construction and design bureaus of the various industrial ministries. Provincial construction bureaus handle smaller projects. Railroad engineering divisions of the Peoples Liberation Army construct portions of the expanding rail network, while other sections are the responsibility of civilian engineering bureaus.

II. Trends in Construction and Other Economic Aggregates

This paper presents a weighted index of the three major material inputs (cement, timber, and steel) used in construction in 1949–74.[1] A major problem is to determine what proportion of total supplies is assigned to the construction sector. Another problem, relative weights, is handled by the use of 1957 Chinese wholesale prices. The use of 1957 prices implies that the commodity mix within each major input, that is of grades of cement, qualities of timber, and types of steel, is constant for all years. A further assumption is that changes in inventories of these building materials are negligible. These assumptions, although distorting the index somewhat for individual years, almost certainly have little effect on the long-term trends indicated by the index.

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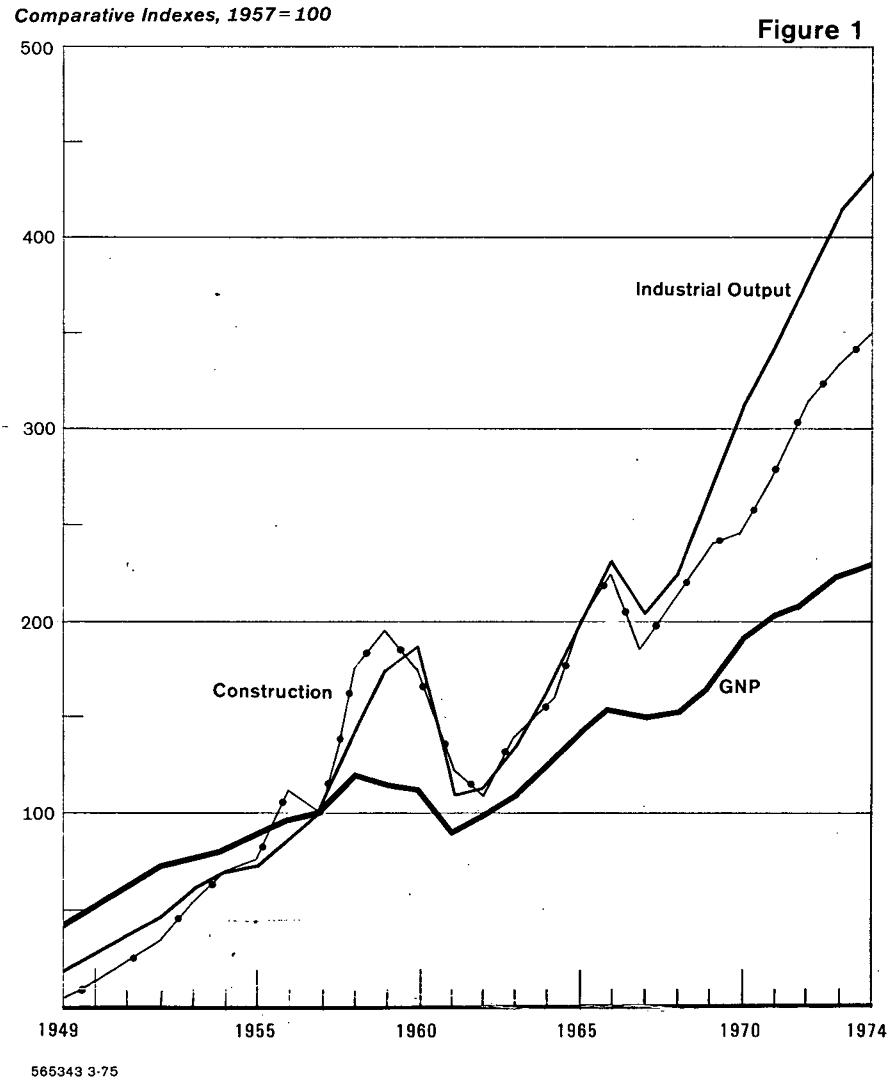
[1] For a chronology of construction activity, see the appendix.

The trend in construction closely resembles the trend in industrial output (see the chart). Construction increased when industry boomed, and it declined when hard times hit the economy. From 1949 through 1957, construction increased at a higher rate than industrial output. From 1958 through 1965, overall, construction grew at about the same

CHINA: Indexes of Construction, Industrial Output, and GNP



rate as industrial output. Since 1965, industrial output has forged ahead at a rate of increase exceeding that of construction.

In a developing country, construction typically grows faster than GNP. This trend holds true for the Peoples Republic. China's reverses, attributable to the Great Leap Forward (1958–60) and the Cultural Revolution (1966–68), depressed all indexes. Construction and industrial output were more volatile than GNP: both fell further than GNP in bad times and grew faster in good times.

III. Methodology Used in Estimating the Building Materials Index of Construction Activity

The following methodological statement discusses the estimates of the physical volume of the building materials used in construction, the price weights, and the full index of building materials. A final section compares the building materials index for 1950–58 with an independent index of construction inputs for that period and discusses the effect on the building materials index of including data on glass and bricks.

In the remaining discussion, the following abbreviations for periodicals are used:

CHCC	*Chi-hua ching-chi (Planned Economy)*, Peking.
CKLY	*Chung-kuo lin-yeh (Chinese Forestry)*, Peking.
FBIS	Foreign Broadcast Information Service, *Daily Report, Peoples Republic of China*, Washington, D.C.
JEC	Joint Economic Committee, U.S. Congress, Washington, D.C.
JMJP	*Jen-min jih-pao (People's Daily)*, Peking.
JPRS	U.S. Joint Publications Research Service, Washington, D.C.
NCNA	New China News Agency, Peking.
SCMP	*Survey of China Mainland Press*, Hong Kong, U.S. Consulate General.
SLFT	*Shui-li fa-tien (Hydroelectricity)*, Peking.
SWB	*Summary of World Broadcasts*, BBC, Great Britain.
TGY	State Statistical Bureau, *Ten Great Years*, Foreign Languages Press, Peking, 1960.

IV. Physical Volume of Building Materials

A. Cement

Estimates of cement production of both the modern sector and the small plant sector are given in table 1. A time series for cement exports—which go principally to Hong Kong—was compiled from a variety of sources. Cement exports were deducted from total cement production to derive a time series of cement supplied to the construction sector. Cement cannot be stored easily for long periods and is generally used in the vicinity of manufacture owing to its low value-to-weight ratio. Thus the time lag between production and use of cement is small for most years.

TABLE 1.—CHINA: ESTIMATED CEMENT SUPPLIED TO CONSTRUCTION [1]

[In millions of metric tons]

Year	Production			Exports [2]	Used in construction	
	Total	Modern plants	Small plants		Volume [3]	Index (1957=100)
1949	0.7	0.7			0.7	11
1950	1.4	1.4			1.4	24
1951	2.5	2.5			2.5	43
1952	2.9	2.9			2.9	49
1953	3.9	3.9		0.3	3.5	62
1954	4.6	4.6		.3	4.3	74
1955	4.5	4.5		.4	4.1	71
1956	6.4	6.4		.8	5.6	96
1957	6.9	6.9		1.3	5.6	100
1958	10.7	9.3	1.4	.9	9.8	175
1959	12.3	10.6	1.7	.8	11.5	205
1960	12.0	9.0	3.0	.8	11.2	200
1961	8.0	6.0	2.0	1.0	7.0	125
1962	6.9	5.1	1.8	1.1	5.8	104
1963	9.1	6.6	2.5	.9	8.2	146
1964	10.9	8.7	2.2	.7	10.2	182
1965	14.8	10.9	3.9	1.0	13.8	246
1966	16.9	12.5	4.4	1.0	15.9	284
1967	14.2	10.6	3.6	.5	13.7	245
1968	17.4	12.7	4.7	.3	17.1	305
1969	19.6	13.7	5.9	.3	19.3	345
1970	19.8	13.8	5.9	.3	19.5	348
1971	23.0	13.8	9.2	.6	22.4	400
1972	27.5	14.3	13.2	.7	26.8	479
1973	29.9	14.9	14.9	1.0	28.9	516
1974	31.6	15.2	16.4	1.0	30.6	546

[1] Because of rounding, components may not add to the totals shown.
[2] Estimates of export volume derived from a variety of sources.
[3] Total production of cement minus cement exports.

1949–57: Total cement production: TGY, p. 96.
1958: JPRS No. 981–D, Oct. 23, 1959, p. 44.
1959: SCMP No. 2191, February 1960, p. 8.
1960–61: Estimate based on 25 percent of cement produced in small plants (reduced from 33 percent in FBIS, Nov. 22, 1960, p. BBB–7) and a reduction in modern plant output to 9 million tons in 1960 and 6 million tons in 1961. See: Robert Michael Field, "Chinese Industrial Development: 1949–70", People's Republic of China: An Economic Assessment, JEC, U.S. Government Printing Office, May 1972, p. 83.
1962: Chien-chu Ts'ai-liao Kung-yeh, No. 5, Mar. 7, 1964, p. 2.
1963: JMJP, May 3, 1964, p. 1.
1964: JPRS 29, 626, Mar. 16, 1965, p. 59.
1965: NCNA, Peking, Dec. 23, 1965.
1966: Assumes modern plant output increased 15 percent over 1965 and that small plants continued to produce 26 percent of total output.
1967: Assumes modern plant output dropped 15 percent and the small plant output proportion declined to 25 percent.
1968: Small plant output interpolated between 1967 and 1969 output and an increase in the small plant output proportion to 27 percent.
1969: Small plants output: SWB FE/W707/A/13, Jan. 17, 1973.
1969: Modern plants: Derived from small plant output assuming that small plant output proportion was about 30 percent of total output.
1970: FBIS, Jan. 3, 1972, B–10.
Peking Review, No. 2, Jan. 11, 1974, p. 23.
1971: JMJP, Nov. 29, 1971, 1972 total output was 16.5 percent above 1971 and small plant output in 1971 was 40 percent of total output.
1972: Peking Review, No. 2, Jan. 11, 1974, p. 23.
SWB FE/W707/A/13 Jan. 17, 1973.
1973: NCNA, Dec. 22, 1973.
Peking Review, No. 2, Jan. 11, 1974, p. 23.
1974: Assumes a 10 percent increase in small plant output and that 52 percent of total output is from small plants.

At present, the Chinese produce cement in three types of plants. The modern plants with large horizontal rotary kilns produce high-quality cement for domestic consumption and export. The small modern plants, which are equipped with standard-design vertical stationary kilns, also produce high-quality cement. In some cases, vertical kilns (16,000 metric tons per year capacity) are colocated with rotary kilns in modern plants. Some 200 to 400 small modern plants produce about one-half of the small plant output. The third category consists of the true small kilns producing as little as 100 tons per year each. These are backyard or commune kilns and produce low-quality cement.

B. Timber

The time series for timber production is presented in table 2. Timber imports from the U.S.S.R. were added to production to derive estimates of total supplies of timber each year. Other imports and exports of timber have been negligible. Construction in the 1960's received about one-half of the timber supply, according to the figures published by Kang Chao [2] and S.D. Richardson.[3] Thus the estimates of timber used in construction each year, 1959–74, were derived as 50 percent of the total supply.

TABLE 2.—CHINA: ESTIMATED TIMBER SUPPLIED TO CONSTRUCTION

[In millions of cubic meters]

	Production	Imports	Total supply [1]	Used in construction: Volume	Used in construction: Index (1957=100)
1949	5.8		5.8	1.2	10
1950	6.6		6.6	1.3	11
1951	7.6		7.6	2.7	23
1952	11.2		11.2	5.9	51
1953	17.5		17.5	6.7	58
1954	22.2		22.2	9.5	83
1955	20.9		20.9	10.6	92
1956	20.8		20.8	12.3	107
1957	27.9		27.9	11.5	109
1958	35.0		35.0	20.2	170
1959	41.2		41.2	20.6	176
1960	33.0		33.0	16.5	143
1961	27.0	0.1	27.1	13.6	118
1962	29.0	.2	29.2	14.6	127
1963	32.0	.5	32.5	16.2	141
1964	34.0	.5	34.5	17.2	150
1965	36.0	1.5	37.5	18.8	163
1966	38.0	1.5	39.5	19.7	171
1967	30.0	.1	30.1	15.0	130
1968	32.0		32.0	16.0	139
1969	35.4		35.4	17.7	154
1970	40.0		40.0	20.0	174
1971	43.0		43.0	21.5	187
1972	46.4		46.4	23.2	202
1973	50.0		50.0	25.0	217
1974	53.0		53.0	26.5	230

[1] Because of rounding, components may not add to the totals shown.

NOTES AND SOURCES

Production:
1949–70: R. M. Field, op. cit., p. 83.
1971–74: Assumes there has been about a 7½ percent yearly increase since 1970. 1972 increase of 8 percent from FBIS, Jan. 10, 1973, B–12.
Imports: 1961–67: Soviet trade handbooks.

[2] Kang Chao, ***The Construction Industry in Communist China***, Aldine Publishing Co., Chicago, 1968, p. 202.

[3] S. D. Richardson, ***Forestry in Communist China***, Johns Hopkins University Press, Baltimore, 1966, p. 164.

USED IN CONSTRUCTION

1949–58: Construction use of timber has been calculated as 77,000 cubic meters per 100 million yuan of investment, from: CHCC, No. 11, 1957, p. 22. Investment figures are taken from: TGY, p. 23.

This 77,000 cubic meters of timber per 100 million yuan appears to represent the total construction use of timber. Figures from the TGY show 109.38 million cubic meters of timber were produced during the First Five-Year Plan (1953–57). According to CKLY, No. 15, 1958, p. 8, 33.6 percent of timber production was used for architectural construction. This would be 36.8 million cubic meters. In CHCC, No. 11, 1957, p. 22, railroad construction is listed as requiring 201 cubic meters of timber per kilometer and mine use of timber as requiring 259 cubic meters per 10,000 tons of coal. Using the TGY data on railroad construction and coal output for the First Five-Year Plan, and adding 7 percent to the coal tonnage to represent ferrous mine output, railroad requirement for timber was 1.9 million cubic meters and the mining requirement for timber was 13.6 million cubic meters. The total construction requirement for timber is then 52.3 million cubic meters, or 47.8 percent of total production. The total investment during 1953–57 was 66.5 billion yuan (TGY, p. 23). Timber requirements can then be calculated as 78,650 cubic meters per 100 million yuan—sufficiently close to the 77,000 cubic meter figure to accept it given the nature of the data from which these calculations are made.

Timber:	*Cubic meters*
Total production 1953–57	109, 380, 000
Of which:	
Architectural construction: (33.6 percent of total)	36, 751, 680
Used for railroad construction: (9,322 kilometers at 201 cm/km)	1, 873, 722
Mining use of timber (259 cm per 10,000 tons of ore coal+iron equal to 526,440,000 tons)	13, 634, 796
Total timber used in all construction	52, 260, 198

1959–74: Construction use of timber is calculated as 50 percent of total supply, as noted in the text.

TABLE 3.—CHINA: ESTIMATED FINISHED STEEL SUPPLIES TO CONSTRUCTION

[In millions of metric tons]

	Production				Used in construction		Finished steel used in construction as a percent of total supply
	Crude steel	Finished steel	Net imports	Total supply	Volume	Index (1957=100)	
1949	0.16	0.12		0.12	0.06	4	46
1950	.6	.4	0.6	1.0	.1	6	12
1951	.9	.7	.6	1.3	.2	12	19
1952	1.3	1.1	.5	1.6	.3	18	19
1953	1.8	1.5	.9	2.4	.8	47	32
1954	2.2	1.8	.6	2.4	.9	53	39
1955	2.9	2.2	.8	3.0	1.1	65	35
1956	4.5	3.2	.6	3.8	2.0	118	53
1957	5.4	4.3	.4	4.7	1.7	100	35
1958	11.1	6.1	1.5	7.6	2.9	170	39
1959	13.4	8.1	.6	8.7	3.4	200	40
1960	18.7	11.5	.7	12.2	3.3	194	27
1961	8.0	6.0	.1	6.1	2.0	118	33
1962	8.0	6.0		6.0	1.6	94	27
1963	9.0	6.8	.2	7.0	2.3	135	33
1964	10.8	8.1	.4	8.5	2.8	165	33
1965	12.5	9.4	.6	10.0	3.7	218	37
1966	15.0	11.2	1.3	12.5	4.2	247	34
1967	12.0	9.0	1.6	10.6	3.6	212	34
1968	14.0	10.5	1.7	12.2	4.4	259	36
1969	16.0	12.0	1.6	13.6	4.8	282	35
1970	17.8	13.4	2.2	15.6	4.8	282	31
1971	21.0	15.4	2.2	17.6	5.4	318	31
1972	23.0	16.9	2.5	19.4	6.3	371	32
1973	25.5	19.1	3.1	22.2	6.6	388	30
1974	23.8	17.8	3.0	20.8	6.9	406	33

NOTES AND SOURCES

Total supply: 1949–74: For a discussion of the estimates of production and net imports of finished steel, see A. H. Usack and J. Egan, "China's Iron and Steel Industry," in this volume.

1949–74: Volume used in construction.
1949: Estimated using a steel-cement ratio of 0.085, from the 1950 ratio, table 4.
1950–51: Kang Chao, op. cit. p. 202.
1952: Niu, Chung-huang, Wo-kuo Ti-i-ke Wu-nien-chi-hua-shih-chi Ti-sheng-ch'an Ho Hsiao-fei Kuan-hsi, Tsai-cheng Ching-chi Ch'u-pan-she, Peking, 1959, p. 34.
1953–56: Wo-Kuo Kung-yeh-T'ung-chi Ti-ching-yen, State Statistical Bureau, Peking, 1959, p. 69.
1957–58: Based on steel-cement ratios calculated from FBIS, Oct. 20, 1959, BBB6, and Yeh-Chin Pao, No. 48, Dec. 4, 1959, p. 37.
1959–74: See the text.

TABLE 4.—CHINA: RATIO OF STEEL TO CEMENT USED IN CONSTRUCTION

[In millions of metric tons]

	Steel	Cement	Ratio
1950	0.1	1.4	0.09
1951	.2	2.5	.10
1952	.3	2.9	.11
1953	.8	3.5	.22
1954	.9	4.3	.21
1955	1.1	4.1	.26
1956	2.0	5.6	.36
1957	1.7	5.6	.30
1958	2.9	9.8	.30

[1] Derived from unrounded data.

C. Finished Steel

Estimates of production of finished steel are given in table 3. Net imports were added to domestic production to derive estimates of the total supply of finished steel each year. The amount of steel used in construction in 1949–58 was calculated from statements in the Chinese press. For the years after 1958, information of this type is not available. Some relatively stable relationship presumably exists between the quantities of cement and steel used in construction. The ratio of steel to cement used in construction in 1950–58 is presented in table 4. The results for 1950–58 were used as a guide in estimating ratios for the remaining years of the series.

The relationship between steel and cement used in construction was a generally increasing one to 1956 and dropped off somewhat in 1957–58. The ratio of 0.30 for 1957–58 is quite high, compared with the ratio for other nations—the U.S.S.R.: 0.19 in 1969–70; the United States: 0.14 for the 1950's and the 1960's; and Japan: 0.09 in 1970–71. The ratio in China was high because of the predominance of steel-intensive construction such as heavy industrial buildings and railroad lines.

In estimating the amount of steel used in construction since 1959, it was arbitrarily assumed that the steel-to-cement ratio has declined at the rate of 0.5 percentage points per year on the basis of changes in the direction of the construction effort and the experience in other countries—the steel-cement ratio of the U.S.S.R. declined from about 0.30 in 1955 to 0.19 in 1969–70. The amount of steel used in construction is then calculated from these ratios by using the estimates of cement used on construction in table 1.[4]

[4] Alternative assumptions about the rate of decline in the steel-to-cement ratio would yield lower or higher estimates of steel used in construction, depending on whether the rate of decline was higher or lower than 0.5 percentage points per year. However, the rate of decline would have to vary considerably from 0.5 points per year to yield substantially different results in the final index. For example, the use of the 0.5 figure gives a total construction index of 349 for 1974 (with a 1957 base), whereas the use of a 1.0 figure would have given an index of 329, and the assumption of an unchanging steel-cement ratio would have given an index of 410. For the lower estimate, the steel-to-cement ratio was not allowed to decline below 0.20.

As indicated in table 3, this methodology indicates that the share of total steel supplies used in construction has tended to drop over the years since 1956–57. Such a trend is

D. *Price Weights*

The 1957 wholesale price weights used for the three commodities were as follows:

Cement: 55 yuan per metric ton.[5]
Timber: 98.4 yuan per cubic meter.[6]
Finished steel: 682 yuan per metric ton.[7]

V. The Building Materials Index of Construction Activity

The building materials index of construction activity is given in table 5. The amounts of each building material used in construction were multiplied by their respective prices to derive a value figure for each commodity. These value figures were added together to derive the total value of the three commodities for each year. An index was then calculated by setting the value in 1957 equal to 100.

TABLE 5.—CHINA: THE BUILDING MATERIALS INDEX OF CONSTRUCTION ACTIVITY

	Cement		Timber		Finished steel		Total value—million yuan [2]	Building materials—Index [1] 1957=100
	Million metric tons	Million yuan [1]	Million cubic meters	Million yuan [1]	Million metric tons	Million yuan [1]		
1949	0.7	36	1.2	114	0.1	38	189	7
1950	1.4	78	1.3	132	.1	82	291	11
1951	2.5	137	2.7	266	.2	170	573	22
1952	2.9	157	5.9	578	.3	215	950	37
1953	3.5	194	6.7	655	.8	520	1,369	53
1954	4.3	235	9.5	936	.9	622	1,794	70
1955	4.1	224	10.6	1,042	1.1	726	1,993	77
1956	5.6	307	12.3	1,206	2.0	1,373	2,886	112
1957	5.6	306	11.5	1,130	1.7	1,138	2,573	100
1958	9.8	539	20.2	1,990	2.9	2,005	4,534	176
1959	11.5	631	20.6	2,027	3.4	2,347	5,005	195
1960	11.2	616	16.5	1,624	3.3	2,253	4,493	175
1961	7.0	385	13.6	1,335	2.0	1,384	3,104	121
1962	5.8	318	14.6	1,438	1.6	1,123	2,879	112
1963	8.2	450	16.2	1,597	2.3	1,562	3,609	140
1964	10.2	560	17.2	1,696	2.8	1,911	4,168	162
1965	13.8	757	18.8	1,845	3.7	2,536	5,138	200
1966	15.9	876	19.7	1,941	4.2	2,877	5,694	221
1967	13.7	753	15.0	1,479	3.6	2,428	4,660	181
1968	17.1	943	16.0	1,574	4.4	2,981	5,498	214
1969	19.3	1,060	17.7	1,742	4.8	3,286	6,087	237
1970	19.5	1,071	20.0	1,968	4.8	3,253	6,292	245
1971	22.4	1,234	21.5	2,116	5.4	3,671	7,021	273
1972	26.8	1,473	23.2	2,283	6.3	4,292	8,048	313
1973	28.9	1,587	25.0	2,460	6.6	4,527	8,574	333
1974	30.6	1,682	26.5	2,608	6.9	4,693	8,982	349

[1] Derived from unrounded data.
[2] Because of rounding, components may not add to the totals shown.

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reasonable because the residual steel supplies have been used primarily by the machine building industry. Chinese claims, as well as estimates by foreign observers, indicate that the machine building industry has been expanding much faster than both construction and industrial production as a whole. See, for example, *Peking Review*, Nov. 2, 1973, p. 22; Field, op. cit., pp. 67–68, 80; and Thomas G. Rawski, "Recent Trends in the Chinese Economy," *China Quarterly*, No. 53, January–March 1973, p. 10.

[5] *SLFT*, No. 18, 1958, p. 15. No. 400 cement.

[6] Academia Sinica, Shanghai Economic Research Institute, and Shanghai Academy of Social Science, Economic Research Institute, *Shang-hai Chieh-fang Chien-hou Wu-chieh Tzu-liao Hui-pien 1921–1957* (A Compilation of Reference Materials of Shanghai Commodity Prices Before and After Liberation), Shanghai Jen-min Ch'u-pan-she, Shanghai, October 1958, pp. 509–511.

This reference gives a retail price of 186.60 yuan for pinewood. Two adjustments are made to convert this to a wholesale price for roundwood, as follows.

a. The price is multiplied by the ratio of the wholesale to retail cement price (55/73) derived, respectively, from reference No. 1 above and page 511 of reference No. 2. The result, 140.60 yuan, is the sawn wood wholesale price.

b. 140.60 is then converted to an equivalent roundwood price of 98.40 yuan when multiplied by the 0.7 conversion factor. See: *Forestry in Communist China, op. cit.*

[7] *Ibid.* Adjusted by weighting estimated amounts used in construction, by type and grade, in order to derive the price of 682 yuan per ton.

VI. Comparison With Kang Chao's Index of Construction

The index for this paper is tested against an index by Professor Kang Chao of the University of Wisconsin.[8] Kang Chao presents an index of inputs to the construction sector covering 1950–58. He uses official Chinese data on steel, timber, cement, glass plates, other building materials, and labor. This index, converted to 1957=100 from its 1952 base is given in table 6. The two indexes show the same general pattern.

VII. Other Building Materials: Glass and Brick

No time series are available on such inputs to construction as plywood, precast concrete, and plastics. Data on production of glass and brick from 1949 through 1960, however, are available. A new index was calculated including all five materials (cement, timber, steel, glass, and brick). This expanded index differs little from the original index (see table 7). This result suggests that the inclusion of glass and bricks in the whole index would not appreciably alter the pattern of construction activity as set forth in this paper. If five items are used, bricks (at 40 yuan per 1,000 bricks) would constitute 17–21 percent of the total value of building materials in the construction sector. Production thus would have amounted to an estimated 45 to 60 billion bricks in 1974—a reasonable figure, considering the production of 30 billion bricks reported for 1960. Glass (at 1.29 yuan per square meter) represents only about 1.5 percent of the total value of building materials in the five-item analysis, so that 1974 production would have been about 130 million square meters of flat glass. In 1960 the production of glass was 66.5 million square meters.

TABLE 6.—CHINA: COMPARISON OF THE PRESENT INDEX AND KANG CHAO'S INDEX
[1957=100]

	Building materials index of this paper	Kang Chao's index of inputs to construction
1950	11	12
1951	22	21
1952	37	34
1953	53	53
1954	70	67
1955	77	72
1956	112	112
1957	100	100
1958	176	166

[8] Kang Chao, *op. cit.*, p. 57.

TABLE 7.—CHINA: EFFECTS OF THE INCLUSION OF GLASS AND BRICK ON THE CONSTRUCTION INDEX

[1957=100]

	Index of this publication[1]	5-item index[2]
1949	7	8
1950	11	10
1951	22	18
1952	37	28
1953	53	42
1954	70	56
1955	77	65
1956	112	98
1957	100	100
1958	176	160
1959	195	175
1960	175	165

[1] Based on cement, timber, and steel used in construction.
[2] Based on cement, timber, steel, glass, and brick used in construction.

Appendix

Chronology of Construction Activity, 1949–74

1949–57, Rehabilitation and the First Five-Year Plan

During the reconstruction phase, construction activity was directed toward the rebuilding of the war-damaged industrial and transportation base. Rail lines were mended; damaged or idle factories were returned to production; and a small amount of new plant construction was initiated. With the adoption of the First Five-Year Plan (1953–57), industry was given priority over other types of construction. Soviet building specifications were adopted, and Soviet technical assistance was provided. The main results were an increase in basic heavy industry and in the railroad network.

1958–60, The Great Leap Forward

The Chinese felt during the late 1950's that a much faster pace of development could be attained by adding massive inputs of labor to the construction process. Work on the core Soviet-aid plants was supplemented by a fast-paced program of building thousands of small iron furnaces, fertilizer plants, cement plants, and machine shops. Severe material shortages quickly developed, and quality of output plummeted. Industrial and construction problems were exacerbated by the harvest shortfalls. The combination of industrial collapse, severe food shortages, and withdrawal of the Soviet advisers in mid-1960 brought the Leap Forward to an end.

1961–65, Readjustment and Recovery

The period of readjustment and recovery was characterized by a return to orthodox planning, including the shutting down of useless small plants. Construction work was first concentrated on major projects that could be finished quickly. Later, renewed investment was undertaken on a selective basis by the central government—featuring the chemical fertilizer, petroleum, and electronics industries. Vast military and related construction was initiated. China turned to the West as a primary source of modern technology and began to purchase substantial amounts of machinery and whole plants. A central theme of this period was the higher investment priority accorded to the agricultural sector and industries supporting agriculture.

1966–69, The Cultural Revolution

The Cultural Revolution was a period mixed in its purposes and effects. The political turmoil disrupted the urban sector and led to material shortages and to delays in the national construction schedule. Some of the hurry-up philosophies of the Great Leap Forward were reinstated, although on a much more moderate scale. Construction materials and funds were once more wasted on poorly conceived small-scale projects. Local decisions on investment were not coordinated with raw material supply or need for the output. In general, the Cultural Revolution had little effect on agricultural production and only temporarily halted the upward trend of industry and construction.

1970–74, the Current Scene

Once the Cultural Revolution had faded, work moved forward rapidly on major projects in industry, transportation, and other sectors, and the small plant program was pushed on a fairly rational basis. Small cement plants were built in great numbers, reaching 2,800 by 1973, with output equaling the output of the modern cement plants. Small fertilizer plants were also stressed, and their output is claimed to be greater than the modern plants. The construction of small plants had once more outpaced the availability of construction materials and supporting inputs, such as fuels. Another reexamination of priorities among small plants has been in process with the result that the level of small plant construction has been drifting downward over the past 2 years.

Current construction activity in China reflects the revised investment priorities of late 1972 and 1973, under which Peking is attempting to bolster deficiencies in agricultural and industrial performance. Construction activity now features industrial projects supporting agriculture, the buildup of electric power capacity, port and harbor improvements, and capital improvements in the raw materials industry (mining). China in 1973 contracted with Japan, the United States, and Western Europe for $1.2 billion worth of industrial plants—mainly chemical fertilizer and artificial fiber plants. In 1974, plant purchases were about $900 million, dominated by the steel rolling mill (more than $500 million) to be built at Wu-han.

For the next 2 to 5 years, construction activity will feature industries producing chemical products, raw materials, and electric power. This activity will include the construction of the numerous foreign plants now under contract. Construction in the mining industry will give priority to open-cut mining, a technology in which China has much to learn from the West. Construction of major new facilities at international ports will parallel the expansion of foreign trade. The steel industry will continue to have high priority in construction, with the major emphasis on capacity to produce finished steel. The petroleum industry has been speeding up its already fast pace. Development during the next few years will give top billing to oil pipelines and to the opening up of offshore deposits in the shallow Pohai Gulf.

Part III. RURAL AND AGRICULTURAL DEVELOPMENT

CHINA: AGRICULTURE IN THE 1970's

By Alva Lewis Erisman

CONTENTS

Tables

Conclusions

The major conclusion in my paper on agriculture in the last JEC volume on the People's Republic of China was that:

> the increase in grain production through 1975 probably will be sufficient to maintain per capita food supplies but not sufficient to provide large extra quantities of raw materials for industry or export. A run of bad luck in weather or a retreat from the permissive policy toward private activity in the countryside would reduce these gains. Shortcomings in domestic agricultural technology will increasingly constrain the advance in the agricultural sector.[1]

[1] Alva Lewis Erisman: "China: Agricultural Development, 1949–71," *People's Republic of China: An Economic Assessment,* Joint Economic Committee of the U.S. Congress, Washington, 1972, p. 143.

Since that paper was written in late 1971, the weather has been generally unfavorable and marginal returns from inputs produced in small plants have declined. As a result, Peking has found it difficult to increase the output of grain and essential nongrain crops as rapidly as population. Crops were poor in 1972. To maintain consumption the Chinese temporarily:

Stepped up imports of grain and cotton;

Broadened imports to include corn, soybeans, and soybean oil; and

Turned to new (United States) and former (Australia, Argentina, and France) suppliers.

At the same time, Peking has assured itself of grain for the medium term and has made the sizable adjustments in investment priorities necessary for a longer term solution to the agricultural problem.

Major changes include:

Concluding multiyear agreements with Canada, Australia, and Argentina to provide a maximum of 4.8 million tons of grain annually through 1976;

Downgrading the concept of the small plant churning out low quality inputs;

Importing 13 large chemical fertilizer plants to provide first-class inputs and synthetic fiber plants to supplement supplies of natural fibers;

Intensifying work on capital construction projects to improve and extend farmland;

Limiting sideline activities that might interfere with peasant obligations to the collective; and

Increasing the acreage of grain crops by expanding multiple cropping and limiting the acreage of industrial crops.

The fertilizer plants are the key to China's agricultural development. When the last of these plants come into operation in 1978 or 1979, China's supply of nitrogen fertilizer will reach 8 million tons, double the current availability. The giant increment in nitrogen fertilizer clearly will be a major shot in the arm for agriculture although marginal returns will probably be low, at least initially, because fertilizer will outstrip the availability of complementary inputs—effective water control; very-high-yielding varieties of seed; sufficient trace elements; phosphoric and potassium fertilizers; of agricultural chemicals, et cetera—necessary for top yields. Even so, grain output could increase to about 300 million tons by 1980. Peking's use of its limited scientific capabilities to achieve practical short-term objectives (such as simple seed selection and crossing) rather than to do basic, in-depth research (such as sophisticated varietal development) may prove to be the most serious impediment to China's progress in modernizing agriculture.

Through the rest of this decade China will continue to rely on imports to maintain consumption, especially in years of below-normal harvests. Moreover, China's population and hence requirements for food and fiber for domestic consumption will also increase. Even with the accelerated programs to modernize agriculture, the PRC may not be able to attain self-sufficiency in both grain and essential nongrain crops by the end of this decade.

I. Background

A. Early Strategy, 1949–61

Peking's agricultural policies in the 1970's are the outgrowth of two decades of success, failures, and unfinished tasks. Chairman Mao Tsetung and his associates initially saw the bringing about of two "transformations" as the solution to the agricultural problem: The "socialist transformation" (collectivization) and the "technical transformation" (intensification of primitive investment and upgrading of traditional production practices). They believed that these transformations plus limited, but selective, investment would enable agriculture to feed and clothe a large and rapidly growing population, provide raw materials to industry, and provide surpluses that could be exchanged for foreign industrial equipment. The transformations were to be in gradual stages. Each stage was to be accompanied by (a) firmer government control over management and distribution in the agricultural sector, (b) increased local investment—the expansion of productive capacity through the input of peasant labor and local materials—and (c) intensification of traditional modes of agricultural production. According to Peking's original timetable, collectivization was to begin in 1950 with the formation of mutual aid teams, move through the stages of small and large agricultural producer cooperatives, and finally, culminate in 1967 in the commune, the ultimate Communist organization.

As for capital investment by the central government, most expenditures were earmarked for high-cost projects to harness the rivers of the North China Plain. This region, over one-fifth of China's total farmland, suffered from chronic drought, flooding, and waterlogging. Although the river control schemes were not to be completed for a number of years, returns were expected as early as 1952 and major payoffs were anticipated by no later than 1955.

The plans underestimated the technical problems involved and overestimated the speed with which the construction could be carried out. These problems were illustrated by the failure of State projects to moderate the effects of devastating floods in 1954 and in 1956 after construction was well underway. As a result, agricultural output fell farther and farther behind the assigned targets. Peking attempted to make up lost ground and get back on trend by accelerating and intensifying the socialist and technical transformations of agriculture. Thus, each calamity in the North China Plain was followed by an unscheduled acceleraton in the collectivization of agriculture.

By 1957—the last year of the First Five-Year Plan—time was running out. During the plan period good gains had been made in the output of basic necessities,[2] but the large surpluses that had been expected did not materialize. Furthermore, most of the increase in basic necessities occurred early in the plan. As for the river harnessing schemes, the floods of 1954 and 1956 dramatized the inadequacies of the original plans. Revised plans—completed in mid-1957—were not promising. To continue the schemes would require over seven times the investment originally budgeted and the payoff would be further delayed.

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[2] For output of grain and cotton, 1949–74, see table 1.

TABLE 1.—CHINA: ESTIMATES AND OFFICIAL ASSESSMENTS OF THE OUTPUT OF GRAIN AND COTTON, 1949-74[1]

Year	Grain[3]		Cotton	
	Estimate (million M.T.)	Official assessment	Estimate (million M.T.)	Official assessment
1949	108	108	0.44	0.44.
1950	125	125	.69	.69.
1951	135	135	1.03	1.03.
1952	154	154	1.30	1.30.
1953	157	157	1.17	1.17.
1954	160	160	1.07	1 07.
1955	175	175	1.52	1 52.
1956	182	182	1.45	1 45.
1957	185	185	1.64	1 64.
1958	200	(250)[4]	1.70	(2.01).[4]
1959	165	(270)[4]	1.20	(2.40).[4]
1960	160	150	.90	
1961	160	Forecast an increase of 10,000,000 tons	.80	
1962	180	Grain harvest was normal to good, better than 1961; output was about 20,000,000 tons greater than 1960.	1.00	Cotton acreage was generally lower than 1961.
1963	185	Output of food grains shows an increase over 1962	1.20	Output of cotton increased by a big margin.
1964	195	Grain output exceeded the 185,000,000 tons produced in 1957; grain output was close to 200,000,000 tons.	1.70	Gross cotton output increased by 37 percent and the per unit yield by 23 percent over 1963. The per unit yield was a record.
1965	210	Grain output was about 200,000,000 tons	1.90	Both per unit yield and output of cotton were at an all time high.
1966	215	Reaped biggest grain crop in history, both per unit yield and output showed a marked increase over those of last year.	1.80	
1967	230	Grain registered a considerable increase over last year's record; grain output was from 9,000,000 to 10,500,000 tons above 1966; Anna Louise Strong reported grain output to be 230,000,000 tons.	1.90	Cotton output exceeded all previous records.
1968	215	Won another excellent harvest	1.80	Achieved another good cotton crop despite serious natural calamities; from 1966–68 the average unit yield of cotton was 12.5 percent and average gross yield of cotton was 12.2 percent above 1965.

1969	220	Total grain harvest was higher than last year	1.80	Cotton harvest is excellent.
1970	240	Edgar Snow reported output to be 240; total and per hectare grain output exceeded the previous records.	2.00	Good cotton harvest each year 1966–70 with total and per unit yields surpassing the precultural revolution levels.
1971	246	Total and per hectare grain yields exceeded 1970 records; grain output reached 492,000,000,000 catties (246,000,000 tons), an increase of 100,000,000,000 catties (50,000,000 tons) over 1957; 250,000,000 tons of grain produced.	2.20	Cotton output increased 4 fold since 1949.
1972	240	Total output of grain expected to reach 240,000,000 tons or about the same as 1970; grain output declined by 4 percent or 10,000,000 tons; total grain output soared from 110,000,000 tons in 1949 to 240,000,000 tons in 1970.	2.10	Cotton output was slighty below 1971.
1973	250	1971 grain production was 246,000,000 tons; this year's grain output topped 1971 to set a new record; total grain topped the 250,000,000 tons produced in 1971.	2.50	Cotton production was 20 percent greater than 1972.
1974	255	Total grain production shows a fairly big increase over 1973; total grain output reached a new level; since liberation grain output has increased 140 percent.	2.50	Last year was a record year for cotton and good results were obtained this year; cotton output has increased 470 per cent over 1949.

[1] The data for 1949, 1952, and 1957, which are reported in the "Ten Great Years," are believed to be internally consistent and reasonably accurate. In contrast, the data for 1958 and 1959 are Leap Forward exaggerations although the figures for cotton output can be derived from data appearing in the Chinese press as recently as April 1971. In the 1960's formal statistical reports were replaced by disjointed announcements from various official and semiofficial sources that are hard to interpret. The reporting of selected data reappeared in the official press in the 1970's. Many of these data are rounded or are expressed as percentage increases over some earlier base, usually 1949. For example the statement "1974 grain output was 2.4 times 1949" output could imply a 1974 output as high as 264,000,000 tons. Since, a) the base, the percentage, or both are generally rounded, and b) some data may be internally inconsistent, the estimates derived from them are approximations rather than precise measurements.

[2] Grain, as defined by the Chinese, consists of any staple foodstuff and normally includes: a) rice, wheat, and other small grains; b) coarse grains such as corn, millet, and kaoliang (Chinese sorghum); c) tubers (white and sweet potatoes, yams, and cassava) at a ratio of 4 units of tubers to 1 of grain; and d) lentils, such as field peas and various types of beans. Rice, small grains, and coarse grains are reported on an unmilled basis. The definition varies from period to period and province to province. For example, chestnuts are considered a grain in some areas of Southwest China whereas in Central China a portion of the sweet potato crop is reported as an industrial crop. At various times soybeans have been reported as a grain crop partly as a grain crop, and partly as industrial crop, or beans. In the past the terms total grain, gross grain, or total food have been signals that soybeans were included.

[3] Because of the accumulating body of data on provincial acreage, yield, and output, the national output estimates are currently being reviewed. This review may resolve some of the discrepancies between the current estimates and the official assessments. For example, the estimates for grain for the years 1960–63, 1965, and 1967 may be too high.

[4] Exaggerated Leap Forward claim.

The regime could not afford to wait. The Second Five-Year Plan (1958–62), which was to follow the Soviet style script of the first plan, was suddenly swept aside in 1958 by the establishment of communes and by the Great Leap Forward. All river harnessing schemes except that for the Yellow River were abandoned. The leap rested on the questionable belief that a doubling of an already stern work pace would generate the heretofore elusive agricultural surpluses, thereby bringing industrialization several decades closer. The result of this approach to agricultural development—combined with three consecutive years of bad weather, 1959–61—was a sharp decline in output and severe nationwide shortages of food.

B. Agriculture First, 1962–69

After three successive poor harvests and the failure of the Sanmen Gorge Reservoir—completed in 1960—to control the Yellow River, Peking restructured its investment priorities both among economic sectors and within agriculture. In the fall of 1962 the "agriculture first" policy was introduced. This policy provided for the allocation of a much larger share of state investment to agriculture and a redirecting of the industrial sector to provide more inputs for agriculture. Imports of chemical fertilizer and annual purchases of large quantities of grain to help feed urbanites in North China were put on a permanent footing. Finally, the more crippling features of the commune system were abandoned. Decisions on day-to-day agricultural management were decentralized from the commune to the small production team. In return for putting in a reasonable effort on the collective acreage, the rural population was again permitted to engage in the cultivation of private plots and in private trade.

In 1963 floods devastated the North China plain. This led to the adoption of a stabilization policy within the framework of the agriculture first strategy, a second major shift. The stabilization policy concentrated the inputs supplied by industry in those areas where natural conditions were the most favorable for immediate increases in agricultural output. State investment was allocated to these selected areas to upgrade water control, thereby creating high, stable yield fields. Such fields reduced the risk of crop failure and maximized the returns from the increasing flow of industrially produced inputs. In short, the planners believed that a shift to already high-yield areas would give a better return at the margin for the investment. The principal effect of the stabilization policy was to move priority for state investment away from the wheat and coarse grain areas of the North China Plain to the predominantly rice-growing areas of south and central China. In the Plain, local investment was to carry the burden. Peasants were set to work digging an immense network of drainage ditches. Whereas these ditches would ease the threat of waterlogging and flooding, they would be of limited use for irrigation.

Beginning in late 1965, the stabilization policy was supplemented by other programs requiring less investment by the state. Most prominent was the campaign for self-reliance, initiated during the early stages of the Cultural Revolution in 1966 and then intensified by the "learn from Tachai" campaign.[3] From a development standpoint, the most important aspect of the self-reliance policy was to increase the

[3] Tachai production brigade in Shansi Province was given tremendous publicity as a do-it-yourself outfit whose members were reclaiming many hectares of unpromising land without state support and were increasing yields each and every year.

dependence on small plants as a source of agriculture inputs. The output of low-quality chemical fertilizers, small water pumps, and simple farm implements produced locally with local investment, increased rapidly and accounted for an increasingly large share of the nonfarm-produced inputs supplied agriculture. Much of the output was of low quality, obsolete by Western standards, and inadequate as a basis for modern agricultural practices. Even so, areas and production teams making use of these simple inputs were a rung higher on the production ladder than their less fortunate neighbors.

Aside from ideological considerations, reemphasizing of a policy of self-reliance had pragmatic origins. Modern inputs—especially chemical fertilizers—had been made available faster than they could be absorbed in high-yield areas. In addition, some low-yield areas, most notably the North China Plain, stood little chance of underwriting the high cost of a modernization program without outside aid. For example, in 1966, over one-half of all state funds for water conservation was allocated for the reconstruction and repair of facilities in the North China Plain, which was still recovering from the devastating floods of 1963.

As a result of the policies of the 1960's, production of grain and subsidiary food was rapidly restored to the pre-Leap Forward level and thereafter increased at a rate somewhat faster than population until the early years of the Cultural Revolution. By the end of the decade, Peking reverted to short-term contracts for grain, apparently confident that the gap between grain output and domestic needs soon would be closed. Cotton and other industrial crops fared less well and remained in relatively short supply.

II. Development Policies in the 1970's

The objective of Chinese policy in the 1970's has been to boost agricultural output while maintaining a balance between local and state investment, between modern and semimodern inputs, between grain and essential nongrain crops, and between socialist enterprises and those activities permitted to function outside the collective sphere.

A. 1970 to Late 1972

After the winding down of the Cultural Revolution in 1969, the leadership made two important modifications in its basic agriculture first policy. First, the increasingly expensive program of developing high-yield farmland apparently was pushed to the background. Second, small, locally constructed plants that had been featured during the Cultural Revolution remained in the forefront as the major suppliers of inputs for agriculture. Thus, semimodern inputs accounted for an increasingly large share of the inputs supplied agriculture and less new land was being provided with the water control necessary to make optimium use of modern inputs if and when more became available.

B. Late 1972 to Early 1975

The fair 1971 harvest and the poor 1972 harvest were warnings that semimodern inputs and small farmland capital development projects were not enough. Output of essential agricultural commodities had increased, but self-sufficiency had not been attained. The requirement for agricultural imports could be sizable if a series of subnormal harvests were encountered. The decline in the rate of overall growth in agriculture since 1967 suggested that China was becoming more, rather than less, dependent upon imports. Furthermore, there was no guarantee that imports could be acquired as needed because of extreme tightness in the international commodity markets.

Beginning in November 1972, Peking took steps to meet these problems. The role of the small plant was downgraded. The regime again turned to accelerated investment of state funds in support of modern industries for agriculture. The most noticeable move was the purchase of 13 huge chemical fertilizer and 4 synthetic fiber plants from suppliers in the United States, Western Europe, and Japan. Crash programs were also introduced to upgrade farmland to high-yield standards in order that modern inputs could be used efficiently when they became available.

III. Collectives and Rural Institutions

The agriculture first policy of 1962 reintroduced private activity to the countryside and shifted a large number of management decisions down from the commune to the smallest unit of the three-tier organization system in rural areas, the production team. These policies withstood Cultural Revolution sniping to emerge in the 1970's more solidly entrenched than ever.

As of early 1975, the private plot continues to be tolerated and private raising of hogs and poultry is encouraged. Income distribution among team members from collective activities continues to be more in accordance with work done than with need or political attitudes as advocated by Communist theoreticians. These realistic policies continue to contribute substantially to increases in the production of vegetables, pork, and poultry.

These policies have been broadened since the Cultural Revolution. First, since 1971, sideline activities such as pottery making and woodcrafts have been encouraged as sources of supplementary income for both individuals and production teams. Second, the central authorities have manipulated rural price relationships as a means of stimulating agricultural output. For example, in the fall of 1971 the price paid for most industrial crops was increased while the price charged for some nonfarm produced inputs was reduced. The price paid for raw sugar was increased by 15.3 percent and for oilseeds—peanuts, sesame, rapeseed—by an average of 16.7 percent. The prices of chemical fertilizers and insecticides were reduced by 9.7 percent; and various types of agricultural machinery and tools by an average of 15.7 percent.

The impact of the government's price policy was twofold. First, some acreage in the collective sector was shifted away from grains. Of greater importance, higher prices encouraged production teams to grow sugarcane, tobacco, and fiber crops on noncultivated land in their spare time. These activities, in essence, are extensions of the private plot and account for most of the recent expansion in the acreage of sugarcane, tobacco, and fiber crops.

The program apparently got out of hand. Following the poor 1972 harvest and again as recently as December 1974 Peking complained that (a) the peasants were spending too much time in private activity; (b) they were too occupied with monetary gain; and (c) too much acreage had been shifted away from grains.[4] To correct the situation, some areas were directed to plant more grain. As for private sideline activities, these could be pursued only after the peasants had fulfilled their obligation to the collective.

No major changes in policy have been announced since 1973. Individual incentives to produce have been maintained. In addition to continued tolerance of the private plot and petty trading, the authorities have apparently relaxed guidelines governing distribution at harvest time in order to give the peasant a larger return for his labor. Discussions in the press of the workpoint system continue to emphasize payment according to work done and tend to downplay payment determined by political attitude or by need. Similarly, workpoint scales for auxiliary farm labor—women and youth—are more generous than in the past.

The more permissive attitude taken toward sideline activities and distribution has widened income differentials in the countryside. Peking has called these differentials perfectly proper "at this stage in the nation's development." The present pragmatic, incentive-oriented policies, however, contradict Communist ideology. A hardening of Peking's permissive policies thus is always a possibility. Changes in these policies will necessarily affect the distribution and efficient use of the nonfarm produced inputs now flowing into China's agriculture. The increased availability of such inputs and their impact upon agricultural performance are discussed in the following sections of this paper.

TABLE 2.—CHINA: IMPORTS, PRODUCTION, AND AVAILABILITY OF PLANT NUTRIENTS FROM CHEMICAL FERTILIZER [1] [2]

[In thousands of metric tons]

Year	Nitrogen			Phosphorous			Potassium		
	Imports	Production	Total	Imports	Production	Total	Imports	Production	Total
1949		5	5						
1950	20	14	34						
1951	40	27	67						
1952	40	38	78						
1953	80	52	132						
1954	136	68	204						
1955	158	83	241		1	1			
1956	270	117	387		14	14			
1957	230	136	366	29	22	51	10		10
1958	350	202	552	9	64	74			
1959	270	275	545		93	93			
1960	210	344	554	5	149	154			
1961	225	290	515		74	74			
1962	240	444	684		103	103			
1963	540	565	1,105		192	192			
1964	324	712	1,036	32	416	449			
1965	590	830	1,420	44	626	671	4		4
1966	712	966	1,678	9	874	884		36	36
1967	1,127	808	1,935	11	727	738	16	68	84
1968	1,207	1,040	2,247	9	761	770	19	92	111
1969	1,304	1,180	2,484	3	963	966	8	100	108
1970	1,480	1,562	3,042		1,103	1,103	5	116	121
1971	1,475	1,900	3,375		1,299	1,299	5	140	145
1972	1,535	2,360	3,895	9	1,439	1,449	5	152	157
1973	1,360	2,880	4,240	83	1,858	1,941	75	168	243
1974	1,000	3,162	4,162	40	1,611	1,651	190	180	370

[1] Source: Unpublished research findings by H. J. Groen and F. L. Smith.
[2] To convert to standard units of product divide nitrogen by 20 percent; phosphorous by 18.7 percent; potassium by 40 percent.

[4] *Canton Southern Daily*, Dec. 24, 1974; *FBIS* Jan. 2, 1975, p. H3.

IV. Inputs

A. Chemical Fertilizer

With the introduction of the agriculture first policy chemical fertilizer joined water control as a key element in China's agricultural development. As shown in table 2, the availability of nitrogen increased from 684 thousand metric tons in 1962 to over 1.94 million tons in 1967. Of the 1.25 million tons increase, imports accounted for 887 thousand tons, or almost 71 percent. The decision to depend upon imports rather than to develop modern complexes for domestic manufacture of chemical fertilizers at that time was dictated by China's restricted technological capability, and the ready access to cheap foreign chemical fertilizer. In all, imports of nitrogen increased from 240 thousand tons in 1962, to about 1.13 million tons in 1967, and to about 1.53 million tons in 1972, making China the world's largest importer of nitrogen fertilizer. Imports of nitrogen declined to 1.36 million tons in 1973 and to about 1 million tons in 1974 because of tight supplies and skyrocketing prices in the international fertilizer market and PRC foreign exchange difficulties.

As for domestic output of nitrogen fertilizers, Peking attempted to substitute quantity for quality. Beginning in 1966, hundreds of small locally financed fertilizer plants were built which increased domestic output of nitrogen from about 830 thousand tons in 1965 to over 2.88 million tons in 1973. In this period the percentage of total output attributable to small plants increased from only 7 percent to over 50 percent. However, the products of the small plants—primarily ammonium bicarbonate and aqueous ammonia—were low in nitrogen and highly volatile. Thus, much of the nitrogen escaped in handling or was lost into the air without benefiting the crops.

In late 1972, China's top leadership decided to increase the supply and quality of chemical fertilizer. Thirteen of the world's largest ammonia-urea fertilizer complexes were purchased. When completed these facilities together with current programs to upgrade other agricultural inputs, will go a long way toward modernizing China's agriculture. The fertilizer complexes will also permit the Chinese to upgrade manufacturing technology, scale of production, and product quality—problems that have plagued the domestic fertilizer industry in the past. Furthermore, the raw material for the new plants will be natural gas, a byproduct of China's burgeoning oil industry.

One weakness of China's chemical fertilizer programs has been the unsatisfactory mix of plant nutrients. The optimum ratio is on the order of 100:50:33 units of nitrogen, phosphorous, and potassium. Until 1962 the input mix was heavily weighted toward nitrogen. Since 1962 domestic output of phosphoric fertilizers has increased. Beginning in 1973, domestic output was supplemented by fairly large imports of phosphorous, mostly in the form of complex fertilizer. Potassium fertilizer lagged badly until 1967, when domestic output began to increase. Large imports of potassium fertilizer were begun in 1973. By 1973, the overall nitrogen-phosphorus-potassium (N-P-K) consumption ratio—while seriously deficient in K—was a more satisfactory 100:46:6.

By mid-1975 the first of the new plants should begin to produce urea. By 1978 or 1979, if construction of all the imported plants is completed without major problems, China will obtain around 3.5 million tons of nitrogen from the new plants—22 percent greater than 1973 output. Thus to maintain and improve the 1973 N-P-K ratio, China will require heavy investment in the phosphoric fertilizer industry and large imports. The PRC will be even more dependent upon imports of potash. Known domestic deposits of potash are small and located in remote areas, far removed from major argicultural areas. By the end of this decade China could require as much as 2 million tons of foreign potash each year.

At the end of the decade, China will still be short of chemical fertilizer, even if the most optimistic plans for domestic output and imports are fulfilled. For example, Vice Premier Teng Hsiao-ping has stated that China requires from 60 million to 70 million tons of chemical fertilizer each year,[5] or about 610 kilograms of fertilizer (standard weight or about 122 kilograms of nitrogen) for each hectare of farmland. In most industrial countries, from 75 kilograms to 150 kilograms of nutrients are applied at present, and the rate is much higher in high-yield areas. Chinese requirements are even higher than implied by these data because of multiple cropping on about two-thirds of the farmland. If the new fertilizer plants are in full production, China could have about 8 million tons of nitrogen by 1980, or about 75 kilograms per hectare of farmland. A single crop of rice in the United States currently receives about 120 kilograms. To equal the application rate in the United States, China would require 240 kilograms of nitrogen for each hectare of double-cropped rice and about 360 kilograms for each hectare of triple-cropped rice.

Availability is only one side of the coin. The other is the response ratio achieved from the fertilizer. To be most effective, chemical fertilizer must be used as a part of a package of inputs, which include effective water control, superior varieties of seed, expert management, disease and insect control, and sophisticated cultivation techniques. Each is essential. Used alone, one part of the package produces only a moderate—sometimes no—increase in yield. However, when combined in a properly balanced mix, the interaction produces an increase in yield which exceeds the sum of the increases from the individual inputs. These complementary inputs are discussed in the remainder of this section.

B. Water Control and High-Yield Fields

Water control has always been central to Peking's program for agricultural development in China. This policy has been necessary because drought, flooding, and waterlogging have historically threatened crops, even in the better agricultural areas. Water control was, and will continue to be decisive because water is the main determinant of the efficiency with which other inputs—chemical fertilizer, insecticides, and high-yielding varieties of seed—can be used.

Since 1970, water control programs have included the maintenance and extension of old facilities, the digging of large drainage canals

[5] "Teng Hsiao-ping Discusses Economy, Cultural Revolution, Taiwan", in *FBIS*, Dec. 10, 1974, p. E3.

in the North China Plain, and the step-up in the supply of pumping equipment. The major expansion in irrigation has resulted from the sinking of thousands of wells for irrigation in the 14 provinces of northern China. Peking reported that a total of 1.3 million wells were capable of irrigating 7.3 million hectares of farmland in late 1974. By comparison, about 100,000 wells were in operation in 1965.

The effectiveness of wells for irrigation and the improvement of existing water control projects depends heavily on power-driven water pumps. Between 1965 and 1975 China's inventory of mechanical pumps reportedly increased from about 8 million to about 30 million horsepower and the area irrigated and/or drained by pumps from 6.6 million to about 33 million hectares.

Apparently the Chinese consider all land irrigated by water pumps to be high-yielding although the capability to resist extreme drought undoubtedly varies from project to project.[6] The average well is capable of providing water for only 5.6 hectares; each horsepower of pumping equipment serves about one hectare of farmland. Under normal weather conditions most small water conservation projects are an asset in areas where traditional agriculture is practiced. However, their effectiveness for modern agriculture or during extremes in the weather is restricted. These latter conditions call for larger projects which can provide a dependable system for storing large quantities of water. The introduction of pumps alone will displace labor and will permit the more timely movement of water in peak seasons, but pumps by themselves will not offset the effects of extended drought or permit the application of high-yield agricultural techniques. The experience of the provinces which have led in the sinking of new wells suggests this method has limitations because an increase in the number of wells often leads to depletion of underground water supplies. For example, the overpumping of water during a 2-week dry period in June 1972 lowered the water table in some areas of the North China Plain to a point where many wells became dry.

The program to establish modern water-control facilities on high-yield farmland almost certainly will continue over the next few years. Productivity of much of the land currently equipped with water pumps—mostly of local manufacture and varying quality—can and will be upgraded through the installation of more efficient pumping equipment. Water supply and cost will be the major determinants of the extent to which additional acreage can be brought under mechanized irrigation and drainage. The need for larger, more complex water pumps and larger storage and delivery systems in particular will increase as the pumping of water is extended to fields farther from the source of water, to higher fields, or as deeper deposits of underground water are exploited. The Chinese press has recently suggested that the responsibility for the construction of water control facilities may have to be shifted upward from the production team to the brigade so that larger, more complex projects can be initiated. As for the North China Plain, the size of the area that can ultimately be irrigated by wells depends on the volume and rate of recharge of underground deposits of water. According to Chinese surveys, about

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[6] *NCNA* Dec. 26, 1974, in *FBIS*, Jan. 3, 1975.

one-half of the farmland in Hopeh, Shantung, and Honan Provinces can ultimately be irrigated by wells.

The labor required to maintain China's water control facilities is staggering in amount. These requirements reduce the amount of labor available for new construction. Maintenance consists of periodic land leveling; dike repair; removal of silt, weeds, and debris from canals and ditches; and the repair of erosion to canal walls. The amount of earthwork required each year to maintain a system varies, but probably averages out to about 10 percent of the earthwork required during construction.

C. Varieties of Seed

Plant breeding and improvement programs in China are currently limited to (a) seed selection and (b) relatively simple methods of crossing and hybridization. These programs—upgrading the general level of seed available to the Chinese peasant—have produced few, if any, "super" varieties. The selection of seed from the hardiest and most desirable plants for sowing the next year has insured that varieties grown are suited to local conditions and minimized seed degeneration.

The Chinese have also exchanged traditional varieties between regions. This practice is believed to have been especially successful in the transfer of varieties of rice.[7] Traditionally *hsien* (*indica* or long-grain) varieties of rice were grown in the southern rice regions and *keng* (*japonica* or short-grain) varieties of rice were cultivated in northern (Yangtze Valley) rice-growing regions. Long-grain varieties grow well on relatively infertile soils, are tall, rather coarse of stem, and can tolerate the deep water associated with inadequately drained paddy land. The major disadvantages of this subspecies is that it is prone to lodging even at low levels of fertilization and unable to tolerate high winds and typhoons. Short-grain varieties respond well to heavy fertilization and—because of their comparatively short stalks—withstand high winds. But, these varieties cannot tolerate deep standing water and are photosensitive.[8] To maintain the high level of soil fertility demanded by short-grain varieties in the absence of chemical fertilizer, a single crop of rice must be followed by a winter green manure crop.

The introduction of the stabilization program opened new opportunities. The growth in the area served by mechanical pumps and the great increase in chemical fertilizers have made possible the cultivation of short-grain varieties of rice in southern paddy areas and an intensification of rice cultivation in the northern paddy areas. Kwangtung Province and the Yangtze Delta in particular have developed the capability to control water depth on a major share of the paddy fields, thereby creating conditions favorable for the growth

[7] Shen Hsueh-nien, "Paddy Rice Cultivation in Communist China," JPRS, No. 13, 946, May 28, 1962.

[8] Photosensitivity refers to the length of day and hours of sun required by a plant to flower. Photo-period insensitive means the plant will flower in a given number of days after planting regardless of the length of day. Because of their photosensitivity, *japonica* varieties are believed suited for cultivation during the spring and early summer in south China. Thus, *japonica* varieties may be grown as the first or early crop of rice, but the second or late crop of rice is probably a traditional *indicia* variety.

of short-grain varieties.[9] The requirement for heavier fertilization was met by chemical fertilizers. In the northern paddy areas, chemical fertilizers were substituted for winter green manure crops. This in turn made possible the growing of two crops of rice[10] in 1 year or the growing of one crop of rice followed by a winter crop instead of one crop of rice followed by a crop of green manure. Shortages of labor during peak seasons—also a limiting factor in the double-cropping of rice in this region—were alleviated by the provision of improved farm equipment.

The prospects of using very high-yielding varieties of seed from abroad do not appear promising. The most successful "miracle" varieties of rice and wheat have been developed for tropical areas. Chinese scientists have tested the high-yielding varieties of rice developed at the International Rice Research Institute; they found their longer growing season was not compatible with Chinese multiple-cropping programs. Imported varieties of spring wheat are promising. These varieties, with modification, could be grown as a winter crop in milder areas of south China where wheat is not now an important crop. The Chinese have also acquired small lots of corn, wheat, cotton, and soybean seed from the United States and other Western countries. Some U.S. observers doubt that the Chinese have the scientific expertise to modify these seeds to grow successfully in China.

D. Mechanization

The mechanization of Chinese agriculture is slowly proceeding from a narrow base. The inventory of farm machinery has expanded with development of electric power and petroleum for agricultural use. In 1971 the Chinese claimed that the production of tractors, walking tractors, internal combustion engines, and rice-transplanters topped previous annual records. More recently—in January 1975, Peking reported that farm machinery output had grown by over 10 percent annually and that output in 1974 was up 14.6 percent over 1973.[11] The use of additional machinery during peak harvest periods when the labor supply sometimes becomes a critical element has enabled the Chinese to gather crops quickly, thereby reducing harvest losses. In some cases, the use of machinery has enabled the Chinese to increase the effectiveness of their limited land resources through the introduction of more intensive cropping patterns. In still other cases, machinery has relieved some of the most burdensome physical tasks of the countryside—the observer often sees one bulldozer and hundreds of basket carriers on rural construction projects. In summary, even though the PRC would be ill-advised to substitute machinery for (the abundant) manpower on a wide scale until more

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[9] Short-grain varieties were first grown on small areas of paddy in Kwangtung Province as early as 1954. By 1964 conditions were suited for the growing of these varieties on a larger acreage.

[10] The growing of two crops of rice in 1 year does not mean that the productivity of the land will be double that of a single crop of rice. Because of more favorable growing conditions throughout its life cycle the yield of an intermediate crop of rice is usually significantly higher than the yield of either an early or a late rice crop. In addition, the double-cropping of rice in central China normally requires that the two crops be interplanted (grown in the same field at the same time) for a varying period of time. For these reasons, under favorable conditions the combined yield of two crops of rice may be 30 to 50 percent greater than the yield of a single crop of rice.

[11] Peking, Mandarin to Southeast Asia, Jan. 3, 1975, *FBIS*, Jan. 8, 1975, p. E–2.

productive employment possibilities are provided outside agriculture, the continued increase in rural mechanization can add an element of flexibility to productive capacity and eliminate at least a portion of the backbreaking tasks.

E. Land Use

Unsuitable topography, soils, and climate restrict the cultivation of crops to slightly over 10 percent (107 million hectares) of the China mainland. Water control projects, urban growth, and the appropriation of agricultural land for roads, railroads, airfields, industrial plants, and military uses have removed good farmland from cultivation. The loss of farmland has been offset to an unknown degree by the reclamation of marginal land for cultivation. Thus, increases in agricultural output must come essentially from increases in the yields from land currently under cultivation.

Since the introduction of the agriculture first and stabilization policies, shorter maturing varieties of seed, simple farm tools, fertilizer, and better water control have been made available to the Chinese peasant. These, together with increased expenditures of rural labor, have (a) increased crop yields, (b) permitted an expansion of double cropping (c) allowed the substitution of higher- for lower-yielding crops, and (d) reduced the amount of farmland that must lie fallow. For example, extensive areas of paddy formerly lay idle over the winter to collect the water required for the transplanting of rice in the spring. Irrigation has now freed many of these fields for the growing of a winter crop. Conversely, large areas of lowland in north China were too wet to permit the sowing of a winter crop. Now these areas can be drained, making it possible to grow a crop of winter wheat.

Multiple-cropping is also being intensified by interrow planting. The abundant labor force is utilized to seed or transplant a new crop between the rows of an existing crop before it is harvested, in effect lengthening the growing season. Intercropping can increase yield by as much as 40 percent. Intercropping and the use of faster maturing varieties of seed have the virtue of exposing crops to vagaries of weather for shorter periods of time.

Intercropping, however, is not without pitfalls. For example, the dense vegetative cover increases the likelihood of plant disease and insect damage. In the longer run, intercropping may not be compatible with plans to modernize agriculture. With intercropping, crops mature at differing rates. The optimal time to irrigate or drain a field or apply expensive, high-quality chemical fertilizer for one crop could harm or fail to benefit the other. Intergrowing limits the use of machinery to plant, cultivate, or harvest crops. Finally, interrowing is predicated on the lavish expenditure of labor. If the pool of farm labor should be reduced through employment outside agriculture, China might not have the labor to continue these programs on a wide scale.

F. Research

China's scientific capabilities have been both a source of strength and a potential weakness. Prior to the Cultural Revolution a nondoctrinaire approach to agricultural science more or less prevailed in

China. Long-term research to develop new varieties of seed was underway as was in-depth research in other agricultural disciplines. Research findings and scientific journals from abroad were disseminated among the scientific community.

With the onset of the Cultural Revolution, conditions changed. The press began charging that Chinese agricultural experts were "ivory tower" savants who had spent more than 10 years on the development of new varieties without producing anything useful. The propagandists argued that the peasant masses should be responsible for agricultural experimentation and that the agricultural scientists be scattered throughout the countryside to learn from the peasants at the grassroots level. Agricultural research institutes were subsequently decimated and their members sent to the villages for practical instruction. This practice has carried over into the 1970's in reduced form. Scientists are now expected to spend a few months in the field and then a few months back in their laboratories and classrooms.

Perhaps the most damaging legacy of the Cultural Revolution will ultimately prove to be the interruption of long-term genetic research. Research of this type is essential, both for the adaption of very high-yielding varieties of seed imported from abroad to meet local conditions and the development of such seeds from domestic germ plasm. According to Western scientific delegations, Chinese genetic research is deficient in terms of sophisication and continuity. The sophistication of research, for example, is about 25 years behind the West, or about the level taught in Western universities when the last Chinese scientists were trained abroad.

According to the same delegations, the use of scientists at the grassroots has returned practical, short-term dividends. Local agricultural methods and varieties of seed have been upgraded to maximize output within the constraints of the available inputs and natural conditions which vary widely from region to region and even within regions. Furthermore, the collective organization of agriculture aids in the rapid dissemination and application of improved cultivation techniques within regions.

At the same time, the delegations have reported that China's scientific policies will seriously retard long-term agricultural development. Long-term, in-depth research of the type necessary to produce technological breakthroughs have been sacrificed for more immediate gains. Scientific endeavors have been compartmentalized within local areas with only limited exchange of research results between regions. Scientific journals and research papers, domestic and foreign, rarely are disseminated to the local level. Finally, classroom instruction of budding agricultural scientists is inadequate. The top scientists are Western-trained and nearing retirement. No new blood of similar caliber is being developed to replace them.

V. Agriculture Performance in the 1970's

Whereas the increasing flow of inputs has given a positive slope to the long-run trend line, the success of agricultural production in any given year continues to depend on weather conditions. In 1971 and 1973, for example, unfavorable weather partially offset the beneficial effects of increased inputs. In 1974, weather conditions were improved, but less fertilizer was available so output was lower than it might have been. Rural capital construction programs have gradually led to a reduction in the effects of bad weather; that is, they have cut down the size of the troughs in agricultural production.

China's agriculture continues to be governed by the principle "take grain as the key link and insure all-around development". Thus, grain crops are and will continue to be the main beneficiaries of schemes to upgrade agriculture.

Rice and wheat account for most of the increase in grain output over the past 4 years. Many areas in south and central China now grow two crops of rice each year instead of one. Wheat has gradually gained popularity as a winter crop in both regions. Drainage schemes have permitted a fairly rapid expansion of winter wheat acreage in the North China Plain. More spring wheat is being seeded, primarily as an interrow crop in Northeast China and as a fast maturing spring catch crop in such traditional winter wheat areas as Shantung. The acreage of coarse grains—corn, millet, and sorghum—has remained relatively constant although average yields may be off. To make way for expanded acreages of winter wheat, an increasing percentage of the acreage of coarse grains is planted with lower-yielding summer sown grain in place of normally higher-yielding spring sown grain. Tuber crops and lentils continue to be grown primarily on fields unsuited for other, more desirable crops, or as a catch crop should the main crop fail.

Cotton textiles are the primary cloth for domestic consumption and also a major export. Despite its importance, the acreage of cotton has remained more or less constant over the past decade because of the higher priority assigned to grain. Yields and output over the past years are much improved over those of a decade ago due to the introduction of improved varieties of seed and, presumably, heavier fertilization. Thus, cotton output has fluctuated with year-to-year changes in yield.

The output of major oilseeds—peanuts, rape, and sesame—has lagged since 1970. The growing of peanuts has been more or less restricted to areas of sandy soil, generally unfit for the cultivation of any other crops. Rape is the only oilseed grown as a winter crop, and hence competes with grains for acreage. For example, following the government's announcement in 1971 that higher prices would be paid for industrial crops, the acreage of rapeseed for harvest in 1972 was increased by 40 percent. The expansion was temporary. Grain output was off in 1972 and the acreage of rape was reduced in 1973.

The permissive policies toward sideline activities have stimulated the growing of minor industrial crops, such as tobacco, fiber crops, and sugarcane and beet. The acreage of cane in particular has increased from plantings on formerly uncultivated lands. Although yields are low in comparison with those in more technically advanced sugar producing nations, output has grown from an estimated 1.4 million tons of raw sugar in 1971 to 1.8 million tons in 1974.

Soybean output has long been constrained by the gradual shift of acreage to higher-yielding grain crops. Despite their historical importance as a staple food and export crop, soybeans have received scant official press coverage in recent years. In general, in Northeast China—where most soybeans for export are grown—a good harvest of grain is followed by an expansion of bean acreage the next year, and a poor grain harvest is followed by fewer hectares seeded to beans. Soybean exports have declined steadily from 565,000 tons in 1967 to only 310,000 tons in 1973.[12]

Despite generally higher agricultural outputs thus far in the 1970's, consumption of grain, sugar, vegetable oil, and cotton textiles is still tightly controlled by a closely supervised collection and procurement system and a well-established system of rationing. The regime's objective has been to maintain consumption of basic necessities at adequate but near subsistence levels with improvement in the diet coming—where and when possible—from increased availabilities of such nongrain foods as vegetables, fruit, pork, and poultry. Large amounts of grain traditionally have not been used as feed for livestock and are unlikely to be used for this purpose in the future. Chinese agricultural policies have been and are likely to remain aimed at providing enough grain and essential nongrain crops to meet the needs of a massive, growing population.

The steadily increasing flow of new investment into agriculture should enable the Chinese to produce a record grain harvest each year provided weather conditions are near average. For 4 out of the last 5 years Peking claimed a record harvest of grain. The only break in the trend occurred in 1972 when output admittedly declined.

The increase in grain output must average about 5 million tons each year just to keep abreast of the growth in population. Output in 1974 would have had to approach 270 million tons to maintain per capita availability at the 1957 level. The 270 million tons benchmark was within the range of capability, but weather conditions would have had to be unusually good.

Grain output in 1974 was some 10 million to 15 million tons below the benchmark. Despite the overriding priority for grain production, even the normally roseate official data show a declining rate of increase for domestic grain production. According to these data the average annual rate of increase declined from 2.2 percent during 1957–67, to 1.7 percent for 1968–71, and to 1.3 percent for the period 1971–74. At the same time the overall output of essential industrial crops did not keep pace with the increase in grain production, primarily because sowing plans favored grain crops. On a per capita basis, grains approached and high quality subsidiary foods exceeded the pre-Leap Forward level. Cotton textiles for domestic consumption and vegetable oils, on the other hand, have not increased appreciably above the 1959–61 lows, and rations for these commodities are near the lowest permissible levels.[13]

These problems were brought to a head by the abnormal 1972 harvest. In the fall of 1972 Peking reassessed the agriculture first and stabilization policies and correctly concluded that adjustments in investment priorities were again necessary. Clearly this was not a short-term solution. Several years would be required to construct and bring modern agricultural support industries on stream. In the interim, China would have to rely more heavily on agricultural imports to maintain consumption.

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[12] For trade of major agricultural commodities other than grain, see table 4.

[13] Since the mid-1960's the normal cloth ration has been a little more than 3 yards per person per year in south China, and about double that for persons residing in cooler areas of China. The vegetable oil ration normally fluctuates between 4 and 8 ounces per month.

VI. Trade

A. *Imports*

As previously stated, by 1970 Peking was confident that the North China Plain would soon become self-sufficient in grain, thus eliminating the costly practice of importing grain.[14] Self-sufficiency was not, however, realized, although rising levels of output permitted the regime to cut back grain imports without lowering consumption standards. In 1971, Peking slashed its imports of grain to 3 million tons, substantially below the trend established over the previous decade. The regime took this action in part because of the excellent 1970 harvest and in part to help redress its foreign trade deficit. In 1970 and 1971, China purchased grain from Canada exclusively because (a) Canada could supply all of China needs, and (b) Peking was dissatisfied with the Australian government's failure to extend diplomatic recognition.

The disappointing 1972 harvest and almost unprecedentedly tight world supplies of grain, oilseeds, and certain grades of cotton that prevailed at that time forced Peking to alter its buying practices. Beginning in the late summer of 1972 China:

Stepped up imports of grain and cotton;

Broadened imports to include corn, vegetable oils, and soybeans;

Turned to new (United States) and former (Australia, Argentina, and France) suppliers.

These purchases pushed 1973 agricultural imports to unprecedented heights. As shown in table 3, deliveries of grain reached a record 7.7 million tons, more than two and one-half times 1971 and up almost 60 percent over 1972. Cotton imports in 1972–73 soared to almost 425,000 tons, two and one-half times 1971–72 (see table 4). Historically a major exporter of soybeans, China was forced to purchase large quantities of soybeans and soybean oil for the first time. Almost 10,000 tons of soybean oil was delivered to the PRC in late 1972. In 1973, about 60,000 tons of soybean oil and almost 200,000 tons of soybeans were imported, and over 600,000 tons in 1974.

TABLE 3.—CHINA: IMPORTS OF GRAIN, CALENDAR YEARS, 1961–75
[Million metric tons]

Year	Total [1]	Source					
		Canada	Australia	Argentina	France	United States	Other
1961	5.56	2.26	2.57	0.37	0.26	0	0.10
1962	4.60	2.01	1.23	.53	.28	0	.55
1963	5.45	1.48	3.00	.04	.81	0	.14
1964	6.31	2.07	2.23	1.41	.23	0	.37
1965	5.91	1.60	2.80	1.50	0	0	.01
1966	5.59	2.57	1.31	1.60	.11	0	0
1967	4.94	1.08	2.86	.10	0	0	.90
1968	4.36	2.17	1.59	0	.60	0	0
1969	3.91	1.73	1.85	0	.33	0	0
1970	4.63	1.97	2.22	0	.45	0	0
1971	3.03	3.01	.01	0	0	0	0
1972	4.84	3.88	0	0	0	.96	0
1973	7.68	2.54	.80	.15	0	4.18	0
1974	7.01	1.90	1.39	.73	.21	2.78	0
1975 (preliminary)	4.40	2.20	1.40	.80	0	0	0

[1] Total by source may not add due to rounding.

[14] Apparently output approached self-sufficiency only when weather conditions were unusually favorable. Peking first reported that the area comprising the North China Plain attained self-sufficiency in 1967, a year of an exceptionally good harvest. Similar claims were also made in 1970 and 1974, also years of good harvests. In years of average or below average harvests Peking has reported that the provinces in the North China Plain have "basically" or "initially" attained self-sufficiency—signal words that grain still has to be imported from other areas of China or from abroad.

TABLE 4.—CHINA: TRADE OF MAJOR AGRICULTURAL COMMODITIES [1] [2]

[Thousand metric tons]

	Exports				Imports			
	Rice	Soybeans	Sugar [6]	Cotton [7]	Rice	Soybeans	Sugar [6]	Cotton [7] [8]
1934–38 average	17	2,036	(4)	(4)	704	(5)	352	77
1955–57 average	595	964	3	11	118	(5)	89	22
1960	1,174	996	16	65	28	(5)	203	87
1961	444	335	127	33	62	(5)	1,534	63
1962	577	342	284	11	5	(5)	938	25
1963	640	332	214	0	97	(5)	511	78
1964	791	498	527	9	76	(5)	408	177
1965	552	577	427	9	112	(5)	419	177
1966	1,264	550	500	4	51	(5)	620	129
1967	1,197	565	338	2	24	(5)	556	108
1968	957	571	239	9	(4)	(5)	432	72
1969	801	487	116	11	(4)	(5)	445	66
1970	988	424	88	11	(4)	(5)	530	78
1971	965	460	117	16	(4)	(5)	464	94
1972	815	370	156	16	(4)	(5)	749	160
1973	1,976	310	155	16	(4)	198	736	423
1974	(3)	(3)	(3)	22	(4)	626	(3)	361

[1] Source: Constructed from various FAO and USDA/FAS statistical journals.
[2] China's imports of grain are shown in table 3.
[3] Not available.
[4] Negligible.
[5] None.
[6] Raw.
[7] Crop year beginning Aug. 1.
[8] Imports of U.S. cotton include 127,000 tons in 1972–73 and 194,000 tons in 1973–74. The PRC also purchased 122,000 tons for delivery in 1974–75 but much was canceled.

The sharp Chinese reaction to the short 1972 harvest and to the unsettled conditions that prevailed in the international grain market at the time clearly indicates the great importance Peking places on the timely, uninterrupted flow of grain.

In August 1972 deteriorating crop prospects in North China and the disruption of deliveries caused by the dock strike in Canada—China's sole supplier of grain at the time—forced Peking to seek U.S. grain, the only grain available for immediate delivery in quantity. Between late August and mid-October 1972, the Chinese acquired about 535,000 tons of U.S. wheat. From mid-October to November the Chinese, following their normal practice, began to purchase grain for near term delivery in 1973. The initial purchase was for 1 million tons of Australian wheat—the first contract signed with that country since the fall of 1969—followed by a contract for 1.7 million tons of Canadian wheat.

Following the departure of the Australian and Canadian negotiators, China was confronted by new problems. Peking was informed that, because of the poor wheat harvest in Australia, imports from that country would be cut by almost one-half. Because of the dock strike and its aftermath, Canada was also hard pressed to fulfill its commitment. Furthermore, unseasonal autumn rainfall seriously affected the harvest of coarse grains and soybeans in northeast China. Normally the north China area depends on shipments of grain from the northeast region and on grain imports from abroad to make ends meet. The sudden worsening of this harvest forced the Chinese to buy whatever grain they could find at a price they could afford to pay. Thus the Chinese turned to U.S. grain for a second time. In all, about 575,000 tons of corn—which was cheaper and more readily available than wheat—was purchased as a stopgap until conditions in the world grain trade became more settled.

Although better harvests of grain, cotton, and oilseed were obtained in 1973, output still fell short of requirements. Moreover, Peking realized that imports would be needed for several years. Thus, in the fall of 1973 the Chinese signed 3-year agreements with Canada, Australia, and Argentina to buy a total of from 3.8 million to 4.8 million tons of grain each year beginning in 1974. The Chinese supplemented these purchases with a series of short-term deals for United States, French, and Canadian grain. In all the Chinese contracted for about 8.5 million tons of grain for delivery in 1974 and for 9.5 million tons for delivery in 1975. Peking also began forward purchasing of large quantities of cotton and soybeans—mostly from the United States—for the first time.

Due to the large quantities and great diversity of agricultural commodities available for export, the United States leaped to the forefront as China's leading source of agricultural imports. In 1973, the United States supplied almost 55 percent of the grain, 30 percent of the cotton, about 90 percent of the vegetable oil, and all of the soybeans. In 1974, some deliveries of grain were postponed or delayed, but the United States still provided almost 40 percent of the grain, 54 percent of the cotton, and all of the soybeans imported by the PRC.

The Chinese apparently contracted for larger quantities of agricultural commodities than they could ultimately cope with financially or logistically. Furthermore, forward purchases may have exceeded requirements. Average monthly deliveries of grain almost doubled, from 480,000 tons January–June 1973 to 800,000 tons for July–December 1973. Record deliveries of grain together with greatly increased shipments of cotton and soybeans exceeded the capacity of northern ports, especially during the winter months. By November 1973,[15] long lines of ships began to queue up at northern ports awaiting discharge. Some vessels were unable to berth for 2 or 3 months after arriving off the coast of China; a costly oversight considering the daily demurrage charge for each vessel exceeded $5,000.

In October 1973, Peking began to complain about the quality and condition of U.S. grain being delivered to China. Much of the U.S. wheat was said to be contaminated with a relatively rare smut, TCK [16], while the moisture content of U.S. corn was claimed to be high, thereby causing problems for human consumption.[17] Both commodities were said to contain "foreign substances" for which the Chinese claimed damages. In February 1974 the Chinese rejected several cargoes of U.S. wheat due to TCK contamination. The traders subsequently suspended deliveries until a solution could be worked out. In April the Chinese failed to provide shipping for several cargoes of U.S. corn.

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[15] After the Chinese had contracted for much of the grain for 1974 import.

[16] *Tilletia controversa Kuhn,* or TCK, is a unique smut that requires snow cover, rather than heat to thrive. Between 30 and 60 days of continuous snow cover are required for TCK to survive—a condition that does not regularly occur in any of China's major winter wheat areas and in only the United States Pacific Northwest and parts of New York State. TCK reportedly is also found in western Canada and in limited areas of Argentina and France. TCK does not affect the milling or nutritional qualities of infected wheat and is not a serious depressant of yield. For example, yield on a field with a 2-percent infestation would be cut by about 2 percent.

[17] No. 2 and 3 corn, normally a feedgrain, purchased by the Chinese has a standard moisture content of 15.5 percent to 17.5 percent. The Chinese utilize imported corn for human consumption and hence desire that the moisture content be around 13 percent. The Chinese were unwilling to pay the price for No. 1 corn or an extra charge for drying.

Although the complaints of contamination and poor quality were technically correct, the dispute provided a convenient opportunity to delay deliveries at a time of congestion in northern Chinese ports. Peking had accepted contaminated wheat since the fall of 1972, and did not make a serious issue of the problem until port congestion developed in October 1973. The Chinese refused offers of cancellation and also rebuffed offers of consultation until after the port congestion had subsided. Peking shifted gears in May and June 1974. Vessels were made available to load U.S. corn. An agreement was worked out with traders to resume shipments of U.S. wheat. The Chinese agreed to take 300,000 tons of Argentine corn and 600,000 tons of U.S. soybeans as a substitute for 1.2 million tons of U.S. corn. Finally, new contracts were signed for United States, French, and Canadian [18] wheat, mostly for delivery in 1974. These contracts raised China's total grain purchases for delivery in 1974 to about 9.5 million tons. If shipped as scheduled, deliveries of grain to China—about 1 million tons each month—would probably have strained the capacity of Chinese ports, again giving rise to the specter of lines of ships waiting to discharge grain.

In the fall of 1974, Peking canceled all contracts for U.S. soybeans and requested that a major part of the grain booked for delivery in the last quarter of 1974 be postponed until 1975. Apparently these moves were intended to avoid a repetition of the port congestion that occurred in the winter of 1973–74 and to alleviate Peking's mounting foreign exchange difficulties. The postponements reduced 1974 grain imports to about 7 million tons, about 2.5 million tons less than contracted for.

The Chinese made more trade adjustments in early 1975. Most significant was the cancellation of contracts for almost 1 million tons of U.S. wheat, the total commitment of U.S. grain to China. The cancellation reduced China's imports of grain for 1975 to about 4.4 million tons. Peking was influenced by the following developments:

The world price for wheat at the time of the cancellation had fallen below the contract price, and world prices were expected to fall even more;

China's foreign exchange position was unusually tight;

The 1974 autumn harvest ultimately turned out better than expected at the time the grain was purchased.

Purchases of cotton and soybeans followed a similar pattern. Beginning in the fall and winter of 1972 contracts for these two commodities skyrocketed only to be followed in late 1974 and early 1975 by postponements, delays, and cancellations. The 1972 harvest of cotton and soybeans was poor, forcing Peking to increase cotton imports and begin the importation of soybeans and soybean oil. As in the case of grain, the Chinese turned to the United States because supplies were not available from other sources. All of the soybean oil was delivered. The Chinese contracted for about 1.5 million tons of U.S. soybeans for delivery in 1973 and 1974. About 40 percent of this was canceled in the fall of 1974. In early 1975, Peking also canceled contracts for 245,000 bales of cotton or about one-half of the U.S. cotton scheduled for delivery in 1975 and arranged for postponement of the remainder.

[18] The contract with Canada was for 1 million tons of wheat over and above the 2 million tons purchased within the framework of the multiyear contract.

Cancellation of the cotton contracts was dictated by an improvement in domestic cotton output; the weakening international markets for Chinese exports of cotton textiles; and a growing tightness in PRC foreign exchange.

Sugar is the only other major agricultural commodity imported in quantity. Until 1972, virtually all of China's imports came from Cuba in barter for rice. Subsequently, the PRC has purchased substantial quantities of sugar from Australia and Brazil because of poor Cuban crops and cooling relations between the two countries. Net imports are expected to remain at about 500,000 tons annually through 1976 and possibly beyond. Multiple-year contracts have been concluded with Brazil and Australia and similar agreements are expected with Guyana and Jamaica.

B. Exports

In the 1950's China's agricultural exports were dominated by foodstuffs, of which soybeans and rice were usually the most important. The collapse of the Great Leap Forward in 1960 caused a sharp drop in food exports. Exports moved up in the mid-1960's as the economy recovered, only to suffer another setback during the Cultural Revolution.

Soybeans have declined as an export, primarily because more and more acreage has been shifted to higher-yielding grains. As a result, soybean exports began a secular decline, falling from 565,000 tons in 1967 to only 310,000 tons in 1973. Exports in 1973 were largely offset by the import of almost 200,000 tons of U.S. soybeans. In 1974, the PRC imported an additional 600,000 tons of U.S. soybeans, thus becoming a net importer for the first time.

The reversal of China's position from a net exporter to a net importer of soybeans was only temporary. In 1972 the soybean crop in Northeast China—China's major producer of beans for export—was hard hit by flooding and waterlogging before harvesting could be completed. Damage was so extensive that Peking was unable to fulfill its 1972 commitment to Japan and other countries, and was even forced to import large quantities of beans. With normal growing conditions, the PRC will produce enough beans for domestic consumption and will also have some for export. Exports, however, will be likely to remain around 500,000 tons per year at most for several years to come.

Rice exports slumped in the mid-1960's, but unlike soybeans, bottomed out in 1969 and then began to gain ground. Exports reached 988,000 tons in 1970, declined to 965,000 tons and 815,000 tons in 1971 and 1972 respectively, then boomed to a record 2 million tons in 1973. Exports in the latter year probably represent the high water mark for some years to come. The demand for rice in the international rice trade in 1973 exceeded the stocks in major exporting countries, causing the price of rice to skyrocket. The Chinese apparently took advantage of these atypical conditions by making unusually large quantities of rice available.

Much of the abnormally large exports in 1973 probably came from stocks. The 1973 late harvest of rice was poor in some areas, causing the PRC to withdraw from the international rice market in the winter of 1973–74 even though prices were high and buyers were available. China did not reenter the market until after the results of the 1974 early rice harvest were known, and even then sales were only made to selected customers.

China's rice exports will probably level off at about 1 million tons annually. However, exports of rice have normally been less than half of 1 percent and 1 percent of grain and rice production, respectively. Even in the peak year of 1973, exports constituted only about eight-tenths of 1 percent of total grain and slightly less than 2 percent of total rice output. Thus, if the price were right—economically or politically—China could again make sizable exports available even in years when the domestic rice harvest is not especially good.

Peking has maintained that rice is exported to pay for imports of grain. However, income from rice sales has usually remained far below the cost of grain imports, even in years of unusually high international rice prices. Furthermore, the limited price data that are available suggest that much of China's rice exports is of poor quality by international standards and hence fetches a relatively low price. For example, the PRC could have earned about $145 million from the sale of 815,000 tons of rice in 1972 if (a) all sales were commercial and (b) the sales price per ton were equivalent to that paid for premium rice in world trade ($178 per ton, f.o.b. Bangkok as of Sept. 4, 1972). By comparison, the cost of importing wheat alone in 1972 totaled about $300 million ($66.70 per ton, f.o.b. Vancouver)—more than double the most China could hope to earn from the export of rice under the most favorable of circumstances. The spread narrowed in 1973. International prices varied widely, but Chinese rice exports probably fetched an average price of about $400 per ton. If all sales were commercial, exports of 2 million tons of rice could have produced an income of about $800 million. Wheat imports cost the Chinese about $760 million[19] and corn imports about $150 million[20] for a total outlay of about $910 million.

VII. A Look Ahead

Before 1972, PRC programs for agricultural development hinged primarily on one-time improvements in traditional agricultural practices or were subject to sharply diminishing returns. These improvements did not build a foundation for sustained growth. Current programs to develop high-yielding varieties of seed, to construct modern fertilizer plants, and to expand effective water control, offer the possibility of sustained growth if the mix of modern inputs is combined in an optimumly proportioned package.

Peking has announced that agricultural development will continue to be emphasized during the upcoming Fifth Five-Year Plan, 1976–80. Thus, agriculture should continue to receive its fair share of investment and modern inputs.

Completion of the 13 giant chemical fertilizer plants and a doubling of the supply of nitrogen fertilizer will give agriculture a major shot in the arm by the end of this decade. The fertilizer will probably outstrip China's capability to provide the package of modern complementary inputs to close the technological gap by 1980. The surprisingly low productivity response of the inputs supplied to agriculture over

[19] Imports of 6.1 million tons at an average price of $125 per ton.
[20] Imports of 1.6 million tons at an average price of $95 per ton.

the past decade is indicative of not only the comparatively low quality of the inputs but also the very slowly changing level of agricultural technology. Thus, initially at least, marginal returns from chemical fertilizer will probably be low. Returns could increase rapidly if more parts of the input package are made available, but the increase will probably occur after 1980. Even so, grain output by 1980 could be about 300 million tons, or roughly 18 percent above the level of 1974.

The new fertilizer plants are scheduled to be fully operable in 1978 although this goal may be optimistic. Until production from these plants becomes available, Chinese agricultural development will more or less be a holding action. Meanwhile, China's population and hence domestic requirements for food and fiber will also increase. Thus, at this stage there is no guarantee that current programs to modernize agriculture will enable the PRC to attain self-sufficiency in both grain and essential nongrain crops by the end of this decade. As a minimum, China will continue to rely on agricultural imports to maintain consumption, especially in years of low normal harvests until the new fertilizer plants are in full operation. It is unlikely the PRC will return to the United States for agricultural commodities unless a string of calamitous harvests are encountered and alternative sources are unable to provide grain. Even then, the Chinese could have difficulty finding a trader willing to provide United States agricultural commodities with quality guarantees above those normally provided in the standard commodity contract.

CONSTRAINTS INFLUENCING CHINA'S AGRICULTURAL PERFORMANCE

By DWIGHT H. PERKINS [1]

The problems that Chinese agriculture will have to face over the coming decade differ markedly from those in other less developed countries. There are no obvious and gross inefficiencies in Chinese farming that could be quickly overcome if only the rural population would understand the need to do so or if an effective extension service could be created that could teach them new methods. The Chinese extension service based in the commune system appears to have been functioning well for a decade or more. Where in the early 1960's there was a considerable backlog of new technology waiting on government actions to supply the required inputs, there is no comparable backlog today. And therein lies the problem.

At no time since 1949 have increases in Chinese farm output been achieved with ease, but there is reason to believe that future increases will require even greater effort and an effort of a somewhat different kind from that in the past. Future expansion is not simply a matter of digging more tube wells or pouring on more chemical fertilizer although both will help. New breakthroughs are required in the basic agricultural sciences in China and in the harnessing of the irrigation potential of China's northern rivers. To understand why this is so, one must look back to what has been happening to Chinese agriculture over the past two decades.

FARM OUTPUT AND POPULATION GROWTH

In the 1950's, those responsible for agricultural policy in China attempted to achieve major increases in farm output by what amounted to the massive application of an essentially traditional technology. Tens and hundreds of millions of peasants were mobilized to work on building new irrigation and drainage systems and to improve old ones. Efforts were also made to expand multiple-cropping and to consolidate fragmented plots of land. These actions were in no way half-hearted and they did contribute for a time to modest increases in production. But the potential of these traditional techniques operating alone without complementary modern inputs was quickly exhausted. When the quality of farm management deteriorated during the Great Leap Forward and the weather turned bad in 1959, 1960, and 1961, farm output fell by 20 percent or more (see table 1).

By 1962 the communes had been thoroughly reorganized with the key change being the transfer of the basic accounting unit (the unit responsible for most farm activities) from the 5,000-family commune

[1] In writing this paper I am deeply indebted to the members of the Plant Sciences Delegation to the People's Republic of China led by Dr. Sterling Wortman and to the Water Management Delegation led by Dr. Maurice Albertson for sharing their experiences and insights at a meeting at the National Academy of Sciences, Feb. 20–21, 1975.

to the 30-family production team, a subunit of the commune. With an improvement in the weather, output recovered to the levels of the latter half of the 1950's. Grain, which had encroached on the acreage of cash crops during the crisis years, recovered first followed by less essential items. It would appear that the gross value of farm output may not have fully recovered until as late as 1964 (see table 2).

TABLE 1.—SELECTED FARM OUTPUT STATISTICS (RECONSTRUCTED OFFICIAL CHINESE ESTIMATES)

	Grain output (million metric tons—unhusked)	Cotton output (million metric tons)	Live hogs (million head
1955 [1]	174.8	1.52	87.92
1956 [1]	182.5	1.45	84.03
1957 [1]	185.0	1.64	145.90
1958	(2)	(2)	(2)
1959	(2)	(2)	(2)
1960 [3]	150.0	[4] 1.02	(5)
1961 [3]	162	[4] .88	(5)
1962 [3]	174	[4] 1.03	[4 6] 100
1963 [3]	183	[4] 1.24	(5)
1964 [3]	200	[4] 1.70	[4 6] 150
1965 [3]	205	[4] 2.10	(5)
1966 [3]	220	(5)	(5)
1967 [3]	230.0	(5)	(5)
1968	(5)	(5)	(5)
1969	(5)	(5)	(5)
1970	[7] 240.0	(5)	(5)
1971	[7] 246.0	[8] 2.22	(5)
1972	[7] 240.0	(5)	[9] 248
1973	[7] 250+	(5)	(5)
1974	[10] 259.0	[10] 2.53	(5)

1 These figures are mainly from State Statistical Bureau, "Ten Great Years," pp. 119 and 132.
2 Official data for 1958–59 are unreliable because of the effect of the Great Leap Forward in the State Statistical Bureau,
3 The "official" grain series for the years 1960–67 has never been published by the Chinese, but various visitors to or residents in China were given figures which they subsequently published. These figures are consistent with a number of published Chinese statements about the level of grain output. The cotton output series was reconstructed from rather imprecise statements by the Chinese about the level of each year's output. This reconstruction was done by Kang Chao, "Agricultural Production in Communist China" (Madison: University of Wisconsin Press, 1970), p. 270.
4 Approximately.
5 Indicates that official estimates for these years are not presently available.
6 The number of hogs in 1962 was said to be less than half of the number in 1971 ("Peking Review", Nov. 10, 1972, p. 17). The number of live hogs in 1964 was said to set a new record which probably means slightly above the level of 1957 ("Peking Review", Sept. 24, 1965, p. 17).
7 The 1970–73 grain output figures have been published by the Chinese in a number of sources.
8 "Peking Review," Oct. 13, 1972, p. 12 states that cotton output in 1971 rose fivefold over the level of 1949. J. K. Galbraith, "A China Passage," p. 129, on the other hand, was told that the increase was fourfold. The usual Chinese practice is to say fivefold when they mean that 1971 output was 6 times the level of 1949, but in this case they may have meant 5 times which, would make the two figures consistent.
9 The number of hogs in 1972 was said to be 330 percent above the level of 1949 "(Hyng-ch'i," Apr. 1, 1973, in "Survey of China Mainland Magazines").
10 Chou En-Lai in his Jan. 13, 1975 report to the National People's Congress, stated that cotton output was up 470 percent over 1949 and grain output was up 140 percent.

TABLE 2.—*Gross value of farm output*

	Million 1957 yuan
1957 [1]	53,700
1964 [2] (approximate)	51,500
1970 [3]	72,000
1974 [4] (approximate)	77,700

1 State Statistical Bureau, *Ten Great Years*, p. 118.
2 Chou En-lai in his Jan. 13, 1975, report to the National People's Congress stated that the Gross Value of agricultural output rose 51 percent between 1964 and 1974.
3 Chou En-lai told Edgar Snow that the gross value of farm output in 1970 was U.S. $30 billion and Snow implies that this figure was attained by applying the official exchange rate (2.4 yuan=U.S. $1) to the figure expressed in Chinese currency (Edgar Snow, "The Open Door," *The New Republic*, Mar. 27, 1971, p. 21). For an argument explaining why this figure was probably calculated in constant 1957 prices, see D. H. Perkins, editor, *China's Modern Economy in Historical Perspective*, pp. 154–155.
4 This 1974 estimate was obtained by assuming that the gross value of farm output between 1970 and 1974 grew at the same rate as grain output (which alone accounts for about half of gross farm output). This figure may slightly understate 1974 output in which case 1964 output would also be slightly understated.

By 1964, however, a dramatic shift in China's agricultural development strategy was already well underway. This strategy will be looked at in some detail in a moment. Here we can simply note that the strategy in its initial phase brought about a sharp rise in farm output. By 1967, in the short span of 4 years, grain output had risen 25.7 percent. Even if the somewhat more reliable 1970 grain output figure is used, the average annual rate of increase after 1963 was 3.9 percent.

China's population totals have remained something of a mystery, and the figures in table 3 may overstate the true total. But there is no doubt that farm output between 1963 and 1970 was growing much faster than the number of mouths to be fed. In the 1950's, China estimated that the population was growing at around 2.2 percent a year and some observers such as Ma Yin-ch'u felt the rate might be even higher. In his January 1975 report to the National People's Congress, in contrast, Chou En-lai indicated that for the entire 25-year period since 1949, population has been growing at an average rate of 1.9 percent a year. The implication would appear to be that the population growth rate has been falling perhaps averaging only 1.8 percent in the 1960's and early 1970's. Recent visitors to China have also brought back scattered data that tend to support this view, but the visitor sample is too small and too biased toward urban areas to be considered reliable.

TABLE 3.—*Population*

	Million
1949 [1]	548.77
1953 [1]	595.55
1957 [1]	656.63
1974 [2]	878.00

[1] State Statistical Bureau, *Ten Great Years*, p. 8.

[2] In his report to the National People's Congress, Chou En-lai said "population has increased 60 percent since the liberation of the country." The implied rate of population growth is 1.90 percent per annum for the entire 25-year period, suggesting a decline in more recent years from the 2.2-percent rate of the 1950's. Chou in his report said that China's population was nearly 800 million implying that either the 1953 census was too high or that China is still reluctant to release its best estimates and uses the above shorthand for a variety of political reasons. The Chinese have been referring to China's population as approaching or about 800 million since at least 1970 (see, for example, Edgar Snow's interview with Chou En-lai).

The accelerated pace of agricultural development meant that China by 1970 and perhaps as early as 1967 had made up for the ground lost during and after the Great Leap in per capita as well as aggregate terms. But after either 1967 or 1970 the growth rate in agriculture once again slowed. There is always the danger in making comparisons of this sort that one will compare a peak year of the cycle with a trough or vice versa, but 1974 was clearly a good weather year and 1967 and 1970 probably were as well. The growth rate between 1967 and 1974 was 1.7 percent while that between 1970 and 1974 was 1.9 percent. This growth rate is half or less of that of the period immediately preceding and about equal to the rate of increase in population. The central question dealt with throughout the remainder of this essay is whether this slowed pace is only a temporary pause in preparation for a renewed surge or whether it is a harbinger of long-term difficulties ahead.

Prior to proceeding with an analysis of these output trends, however, two additional facts that bear on the implications of this discussion for the consumption levels of the Chinese people need to be noted. First, China seems to have succeeded in eliminating the most extreme fluctuations in farm output although several decades more of experience will be needed to fully confirm this achievement. In the bad year of 1972, for example, grain production fell by only a little over 2 percent. Second, the rationing of essential foods means that all people are guaranteed their minimum requirements as long as nationwide supplies are adequate. One does not see the phenomenon in China of rich areas holding onto large surpluses while tens of thousands are dying elsewhere in a famine region. Because China has largely solved the food distribution problem both over time and between people, the nation could suffer through a fairly prolonged period of output stagnation before people began to suffer serious malnutrition. The same cannot be said of many other less developed nations.

Sources of Growth, 1962–74

Grain output in 1974 was 74 million tons or 40 percent higher than in 1957. An increase of this magnitude was obviously caused by a rise in agricultural inputs, but which ones?

The amount of land under cultivation does not appear to have risen much since 1957. In fact in 1958, the cultivated area was actually reduced by 4 million hectares according to official estimates. Subsequently, however, commune members did attempt to open up new land in marginal areas and by 1970 it was reported that some 12 million hectares had been added in this way representing about 11 percent of the total land then under cultivation.[2] Since 1970 efforts in this direction have been continued, but most of the activity appears to have been directed at improving existing land under cultivation, not opening up new land. For example, in late 1972 and 1973, some 3.33 million hectares of farmland were leveled and another 1.32 million hectares were terraced or otherwise improved, but no mention is made of a net expansion in acreage.[3] In fact the figure for total cultivated acreage given to several visiting delegations in 1973 and 1974 was about the same as that published in 1958 (107 million hectares).

It may simply be that the figure given to visitors has never been updated since the late 1950's, but a more likely explanation is that new land opened up has been offset by alienation of existing cultivated acreage to industrial and mining uses. China's modern industry has been growing at around 10 percent a year, and many of these factories have been located on the edge of cities in areas formerly devoted to crops. Chinese planners have recognized the problem and have attempted to minimize its impact,[4] but there is no way around the fact that good farm land (flat, located near transport, et cetera) often makes an excellent factory site.

No doubt there remain areas in China where the cultivated acreage can be expanded further. Some writers have spoken of a potential existing in China's underpopulated northwest. But the problem in the far northwest is that theren't much water and where water supplies are sufficient, the land is already in crops.[5] Perhaps at some future date it will prove possible to greatly increase the supply of water to these desert regions, but such an undertaking will be very expensive and is a

[2] Chou En-lai as told to Edgar Snow, *The New Republic*, Mar. 27, 1971, p. 21.
[3] *Peking Review*, Jan. 4, 1974, p. 10.
[4] "China Saves Farmland in Building Industry," *Peking Review*, Feb. 28, 1975, p. 31.
[5] This point was already being made in the 1930's by John Lossing Buck, *Land Utilization in China* (Nanking: University of Nanking, 1937), pp. 169–170.

project for the distant future. For the next decade or two there are better ways for the Chinese to spend their money.

One farm input that China is not short of is labor. No rural labor force figures for China have been published, but there is no question that that work force has been increasing. Children born in the years 1949 to 1959 are now all past the age of 15 and can be considered to be full members of the labor force and it follows, therefore, that this force has been rising at 2-plus percent a year for a decade. There may have been some net increase in the portion of this above 15 age group attending school and, despite the *hsia-fang* or down to the countryside movement, the cities have probably received a net inflow of migrants. But even after subtracting this net loss of rural workers, it appears likely that China's rural work force in 1974 was roughly 20 percent above the level of the early 1960's.

Did this rise in labor input contribute in important ways to the rise in farm output? All farm inputs are in a fundamental way complements to each other making it difficult to single out the impact of one input but a rough estimate of labor's contribution is possible. Estimates in table 4 indicate that China is not yet the world's most densely populated large country if density is measured as the ratio of arable land to total population. But for our purposes here it is the arable land to farm population ratio that is most significant and in China that ratio is vying for the title of world's most densely population farmland. In the 12 provinces of central and southern China, it would appear that the average farm family already has less than 0.15 hectares (about 2 mou) per person. Higher ratios in the north only indicate in most cases that the northern land is much less productive.

TABLE 4.—ARABLE LAND PER CAPITA

Country and year	Population (millions)	Arable land [1] (1,000 hectares)	Arable per capita (hectares)
Japan:			
1969 (total)	102.32	5,603	0.055
1965 (farm)	23.29		.241
Korea (South):			
1969 (total)	31.57	2,311	.073
1965 (farm)	15.61		.148
People's Republic of China:			
1969 (total)	800	107,000	.134
1969 (farm)	560		.191
Thailand:			
1965 (total)	30.74	11,415	.371
1965 (farm)	23.98		.476
India:			
1967 (total)	511.13	163,800	.320
1965 (farm)	340.66		.481
United States:			
1964/5 (total)	194.59	176,440	.907
1965 (farm)	11.67		15.119

[1] Includes both arable land and land under permanent crops as defined by the FAO.

Sources: For all countries except China, Food and Agricultural Organization of the United Nations, "Production Yearbook 1970," pp. 4–6, 16–19. The Chinese figures were derived from table 3 assuming a population growth rate of 1.8 percent and a rural population equal to 70 percent of the total population.

In spite of these low ratios, there is ample evidence that the marginal product of labor in China is not yet zero. There are always areas where the land can be made more nearly level and where the irrigation canals can be lined, but labor productivity in such activities is very low. The transport of farm products to the market or railhead also consumes large amounts of labor when the goods are carried on human backs or animal-drawn carts. There are also brief periods of peak labor demand principally when farmers have only a few days or weeks to harvest one crop and transplant the second. At such times the addition of more workers can make a substantial difference in the amount of grain output eventually achieved.

If, when other factors are held constant, the marginal product of rural labor is not zero, it is unlikely that it is high or even above the level necessary to provide the additions to the rural population with enough to eat. Furthermore, Chinese communes are increasingly turning to machinery to smooth out the peaks in labor demand and to eliminate some of the more time-consuming low-productivity tasks. Rice transplanters and power threshers, for example, make it possible to speed up the transition from the first to the second crop without increasing labor requirements. Hand tractors are no longer a rarity in the Chinese countryside and they appear to be used in large part to pull carts laden with goods to market. And water increasingly is being moved from irrigation canals to the fields by power pumps rather than by water wheels laboriously turned by men and animals. This machinery does not yet exist everywhere in the Chinese countryside and all areas could use more than they now have. But the spread of this equipment appears to have been rapid during the past decade and the pace is, if anything, accelerating.

When all communes and production teams are well equipped with machinery of this kind, the demand for labor for farming will be even less than it is today. As industrialization proceeds, of course, a time will come when all net additions to the labor force are drained off into nonfarm employment, but that time appears still to be two or more decades into the future.[6] In the meantime, rural workers will not suffer unemployment. The commune system effectively guarantees against that. At the same time, further additions to the rural work force will have little impact on farm production. If these new mouths are to be fed at existing or higher levels, more inputs other than more labor will be required.

Chemical Fertilizer

During the 1960's, the farm input that appears to have had the largest impact on China's grain output was chemical fertilizer. From the data in table 5, it is clear that China's chemical fertilizer supplies in 1957 were very small. If one assumes that the nutrient content of China's fertilizer was around 20 percent of its gross weight, then in 1957 China had only from 4 to 5 kilograms of chemical nutrient per hectare. By 1974 the per hectare average had risen to between 50 and 60 kilograms of nutrient.[7] To this figure one must add the considerable quantities of nitrogen supplied by manure and nightsoil. It is impossible to come up with a precise estimate of nutrient from organic sources. Hogs alone, however, probably supplied around 10 kilograms of nitrogen per hectare in the mid-1950's and about 25 kilograms in

[6] The Chinese do not publish nonfarm employment so any statement about the rate of increase in this figure is highly speculative.

[7] The nutrient content of fertilizer produced in small-scale plants is significantly below that in large plants and small plants accounted for most of the increase in output in the latter half of the 1960's. Thus the ratio of nutrient to gross weight probably fell slightly.

the early 1970's.[8] There would also be a rise in nutrient per hectare from nightsoil (population rose by 35 percent or more) and draft animals and at a minimum these probably provided another 30 kilograms of nutrient per hectare.[9]

TABLE 5.—CHEMICAL FERTILIZER DATA

Year	Production (million tons gross weight)	Percent supplied by small scale plants (nitrogenous only)	Imports – (million tons gross weight)[1]
1957	[2] 0.87	NA	1.3
1958	[2] 1.47	NA	1.8
1959	[2] 1.78	NA	1.4
1960	[2] 1.93	NA	1.1
1961	[2] 1.74	NA	1.1
1962	[2] 2.61	NA	1.2
1963	[2] 3.65	NA	2.7
1964	[2] 5.66	NA	1.8
1965	[3] 8.7	[4] 12	3.2
1966	[5] 11.0	NA	3.6
1967	NA	NA	5.7
1968	NA	NA	6.1
1969	NA	NA	6.6
1970	[6] 14.0	[4] 40	7.4
1971	[7] 16.8	NA	7.4
1972	[8] 19.9	[9] 50	7.7
1973		[10] 54	7.4
1974	[11] 24.3	NA	(5.7)

NA—Indicates data not now availalbe.

[1] These import estimates, calculated in terms of a "standard fertilizer equivalent," were reconstructed by U.S. government analysts and published in Central Intelligence Agency, Office of Economic Research, "People's Republic of China: Economic Indicators," March 1975. The 1974 estimate is preliminary.
[2] S. J. Burki, "A Study of Chinese Communes 1965," p. 6. These figures were given to a Pakistani delegation by Chinese officials and are generally consistent with data published in official Chinese sources.
[3] Output in 1965 was 3 million tons above 1964 ("New China News Agency," June 6, 1966 cited in Kang Chao, "Agricultural Production in Communist China," p. 317).
[4] New China News Agency," Dec. 27, 1970 as reported by BBC, Jan. 6, 1971, p. A22. It is not always clear whether the percentage share being referred to is for all chemical fertilizers or nitrogeneous fertilizer only.
[5] Output in 1966 was 26 percent above 1965. "Wo-kuo kuo-min ching-chi ch'uan-mien hsin-yueh-chin" (Hong Kong: San-lien, 1967), p. 30. Also in "Jen-min jih-pao," Dec. 30, 1966.
[6] Edgar Snow (from Chou En-lai), op. cit., p. 20.
[7] Output in 1971 was reported to be 20.2 percent above 1970 (BBC, Jan. 5, 1972, p. A1/2).
[8] Output in 1972 was reported to be 20.1 percent above 1971 ("New China News Agency," Dec. 23, 1972).
[9] BBC, Mar. 28, 1973, p. A9.
[10] BBC, Feb. 13, 1974, p. A15.
[11] Chou En-lai in his January 1975 report to the National People's Congress stated that chemical fertilizer production in 1974 had risen 330 percent over 1964.

What was the impact of an increase of 70 kilograms or more of nutrient per hectare or a total of 7.5 million tons most of which appears to have been applied to grain and cotton? Once again there is no precise answer to this question but plausible guesses are possible. We do know, for example, that China by the mid-1960's had developed and put into use fertilizer responsive seeds, particularly rice seeds, that were as good relative to Chinese conditions as anything developed at the International Rice Research Institute in the Philippines.[10] Other crops had not advanced anywhere near as close to the current world's best standards, but they too were using improved, more fertilizer-responsive seeds. Where sufficient supplies of water were avail-

[8] The Chinese have attempted to estimate the amount of ammonium sulphate equivalent produced by a single hog and these figures have been collected by Kenneth Walker, *Planning in Chinese Agriculture* (Chicago: Aldine Press, 1965), p. 56. I have used a figure of 40 kilograms of ammonium sulphate per hog or 10 kilograms of nitrogen per hog to make the calculations used here.
[9] This statement is based on a calculation by Benedict Stavis, *Making Green Revolution: The Politics of Agricultural Development in China* (Ithaca: Cornell University, 1974), p. 43. Stavis' low estimate for crop nutrients from organic fertilizers is 6.07 million tons and his high estimate is 14.80 million tons.
[10] These developments are described in Benedict Stavis, *op. cit.* The appraisal of these seeds' quality as expressed here is based on the opinions of several members of the Plant Sciences Delegation to China of the National Academy of Sciences.

able, therefore, it is reasonable to assume that the above described rise in fertilizer application must have had a substantial impact on grain yields. Even using the relatively modest yield response ratio of 8 kilograms of grain for every kilogram of nutrient, it would appear that increased fertilizer together with the necessary complementary inputs (water and seeds) made possible a rise in grain output of 50 million tons or more.[11] In short, much of the increase in grain output between 1957 and 1974 can be attributed to the impact of fertilizer and new fertilizer-responsive seeds.

Can China increase grain output indefinitely into the future by simply doing more of the same? Without doubt further rises are possible through the application of more fertilizer, but these rises appear to be becoming more and more difficult to achieve. For example, between 1963 and 1970, a 15.1 million gross ton increase in chemical fertilizer supplies (see table 5) was associated with (it did not necessarily cause) a 57 million ton rise in grain output. Between 1970 and 1974, in contrast, a further 9 million ton increase in chemical fertilizer output was associated with only a 19 million ton rise in grain output.

It does not follow automatically from these figures that the yield response to ever-increasing applications of chemical nutrient is necessarily falling or that it will fall further in the future. For example, a larger portion of the 1970–74 rise in gross tonnage came from small-scale plants where the nutrient to gross tonnage ratio is significantly below that in large plants. But even when one makes substantial allowances for such a decline, the ratio of increased grain to increased nutrient still declines sharply. A second and potentially more serious possibility is that the rise in grain output between 1963 and 1970 was caused primarily by an increase in inputs other than fertilizer. But if this were the case, one should be able to identify the other inputs. Labor and land increases have already been eliminated as likely major causes of the rise in farm output. Much of the new machinery introduced in these years was labor augmenting and facilitated the expansion of double-cropping, among other things. We do not know precisely what has happened to the cropping index since the early 1960's although it has almost certainly risen. But it is unlikely that the rise was sufficient to account for a high proportion of the 1963–70 rise in grain output. China's cropping index was already very high in the 1950's (1.41 in 1957) and large areas of the north cannot be double-cropped because of lack of timely water supplies or a short growing season.[12]

That leaves water as the one major input that alone or together with other complementary inputs could have caused the major spurt in grain output after 1963. Water management will be discussed at greater length below. Here it only need be noted that the spurt in irrigated acreage and in other water control construction activity appears to have taken place in the late 1960's and early 1970's.[13] Thus an unusually high

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[11] For a discussion of fertilizer response ratios in China see Jung-chao Liu, *China's Fertilizer Economy* (Chicago: Aldine, 1970), pp. 112–113 and appendix C. To arrive at an increased grain output estimate, one must also make an assumption about what percentage of fertilizer was used on grain. The figure used here assumes 83 percent which may be a bit high, but then the 8:1 response ratio is probably low.

[12] Parts of the southern and central regions, on the other hand, can be and are being triple-cropped. But the yield on the third crop (wheat) is much lower than on the first two (rice) and the first rice crop is generally much more productive than the second. Thus an expansion in the cropping index does not generally lead to anything like a comparable percentage increase in output even when complementary water and fertilizer inputs are available in suitable amounts.

[13] This statement is based primarily on data collected by James Nickum, "A Collective Approach to Water Resource Development: The Chinese Commune System, 1962–72," (Unpublished Doctoral Dissertation University of California at Berkeley, 1974).

level of water control construction activity in the early and mid-1960's relative to later years cannot explain the higher rate of growth of grain output in the earlier period.

The net result of the above discussion is that the evidence appears to indicate that the marginal yield response to fertilizer did decline markedly between the mid-1960's and the early 1970's. This is not really a very surprising conclusion. Most evidence elsewhere suggests that if you hold seed quality constant, yield response will decline as the level of fertilizer application per hectare rises. Furthermore, where water supplies are limited, fertilizer application must also be held down or it will do more harm than good. Because large portions of China's cultivated acreage are unirrigated and lack adequate supplies of rainfall, it is likely that fertilizer tends to be concentrated in areas where water is plentiful. Since the average rate of application in China appears to be over 100 kilograms of nutrient per hectare (including organic fertilizers), it is likely, that in some rice growing regions, the rate of application is 150 kilograms per hectare or more. At such levels one would expect yield response to be falling.[14]

Will this yield response continue to fall as more fertilizer is added? If new and more responsive seeds are not discovered, the answer is clearly yes. The time is not far off (not much more than 10 years if that) when China's rice growing regions will be applying fertilizer at rates not far below current practice in Japan, and Japan appears to have reached a point where further increases cannot be economically justified.

Can new and more responsive seeds be discovered? The answer of the American Plant Sciences Delegation that visited China in 1974 is yes, but not unless basic research in the plant sciences in China is reorganized and given the resources to work with. If appropriate changes in the organization of basic research are made, dry land crops such as corn and sorghum could achieve large increases in yields in time. The potential of rice is much less. Chinese yields are already at levels comparable to those of the most advanced ricegrowing nations of the world (e.g. Japan).[15] But even with rice some further increase is possible. If appropriate changes in basic research organization are not made, however, Chinese agriculture will probably begin to experience serious difficulties within a decade.[16] No amount of fertilizer will be of much additional help if the complementary inputs are missing.

Water Management

The complicated problem of water has been left for last. In some important areas of water management, Chinese efforts have clearly met with considerable success. Major floods, for example, appear to be

[14] There is no single formula that gives one an accurate picture of what is likely to happen to yield responses as fertilizer application rises, but Williams and Couston have derived a formula based on cross section data for 40 countries that gives some indication of what happens. The average yield response on the first 50 kilograms of nutrient per hectare is 19.5 kilograms of grain per kilogram per nutrient kilogram, for the next 50 kilograms of nutrient, the average yield response drops to 8.2 and on the next 50 it falls to 6.4 (the formula was taken from J. C. Liu, *op. cit.*, p. 113).

[15] International comparisons of rice yields have limited usefulness because conditions other than seed quality and fertilizer input vary so much between countries. How, for example, do you compare yields in Japan where, for the most part, only one crop is possible, with those in central or south China where two rice crops are possible.

[16] Those interested in an analysis of the kinds of changes in basic research organization required are referred to the forthcoming report of the August–September 1974 trip of National Academy of Sciences Plant Sciences Delegation to the People's Republic of China.

a phenomenon of the past. The elimination of large, destructive floods may not have much influence on average grain yields in a good weather year, but it does have a major impact on human welfare and yields in other less good years. As already indicated earlier, flood control together with food rationing have largely abolished the old cycles of feast to famine and back again.

But the problem of bringing adequate and timely supplies of water to the dry lands of north China has proved to be more intractable. The average rainfall for all of north China (excluding the northeast) is only about 20–21 inches a year (525 mm) and in large parts of the region the average is under 14 inches. In drought years this can fall to around 5 inches.[17] Thus in normal years much of north China is comparable (in terms of annual rainfall) to the Dakotas, Montana, and eastern Washington and in dry years the region can dip below the averages of Arizona or Nevada.

In the south, where average annual rainfall is two to three times that in the north, there is no serious problem with water. Irrigation works began to be built in this region 1,000 years ago and more and by the 1930's much of the region was being effectively irrigated.[18] After 1949 and particularly after the formation of cooperatives and communes in 1955–56 and 1958, irrigation was extended and existing systems were repaired and improved. In the 1960's the principal additional improvement was the widespread introduction of power pumps as substitutes for far less efficient water wheels and the like. By the 1970's it would appear that the potential for further improvement in water management in the southern and central ricegrowing regions of China was severely limited. That, at least, is the opinion of a group of American water management experts who were in China in 1974.

The differences between the progress of irrigation in the north as contrasted to that in the south cannot be accounted for by any lack of effort in the northern regions. During the Great Leap Forward years, 1958–59, tens of millions of rural people moved vast quantities of earth and rock in an attempt to solve the northern water problem. But when the work was finished, exaggerated claims discounted, and poorly designed projects abandoned, there had been little if any expansion in irrigated acreage (see table 6). In the years 1959–61, in fact, the north suffered through one of its worst droughts in decades. The problem, in brief, was that the land of the north could not be irrigated by methods that relied solely on the mobilization of rural labor however great the number of people involved.

There are three major ways by which water can be brought to the parched land of the north. The first involves the tapping of ground water through the digging of large numbers of tube wells. The second involves removing the silt from China's northern rivers so that river water can be fed through irrigation canals to the fields. If one attempts to use this water without first removing much of the silt, the irrigation canals will quickly become clogged and useless. The third method of bringing water to the north would be to divert some of the surplus from the Yangtze northward. Such a scheme is not utopian, but it is likely to prove to be enormously expensive and hence is not now

[17] J. L. Buck, *Land Utilization in China*, p. 111.
[18] These historical developments are discussed at length in D. H. Perkins, *Agricultural Development in China, 1368–1968*, pp. 60–70.

being considered in any very active way. It will not, therefore, be discussed further here.

From the data in table 6, it is apparent that China has made rapid progress in introducing tube wells during the past decade and particularly during the past 3 years when over 200,000 wells a year have been dug. Most of these wells are being dug on the North China Plain and they probably account for the bulk of the apparent 10 million hectare expansion in irrigated acreage in recent years. It is not yet clear how much further the development of tube wells can be pushed, but it is reasonable to presume that significant further expansion is possible. It is also not clear whether these tube wells are in effect mining the ground water or whether the ground water is being replaced at an adequate rate. If the supplies of ground water are being mined, i.e. exhausted, tube wells will be only an interim solution to the northern water problem.

TABLE 6.—WATER MANAGEMENT STATISTICS

Year	Total irrigated acreage (Million hectares)	Total irrigated acreage: As percent of total arable	Farmland benefiting from mechanical irrigation and drainage (million hectares)	Tube wells with power pumps (thousands)	Installed capacity of irrigation and drainage equipment (thousand horsepower)
1930's [1]	[2] 26.5	27	0	0	0
1952	[3] 21.3	[3] 20	(4)	(4)	(4)
1955	[3] 24.7	[3] 22	(4)	(4)	(4)
1957	[3] 34.7	[3] 31	(4)	(4)	[5] 560
1958	(6)	(6)	(4)	(4)	[5] 690
1959	(6)	(6)	(4)	(4)	[5] 900
1960	(4)	(4)	---	---	[5] 1,200
1961	(4)	(4)	(4)	(4)	[5] 2,230
1962	(4)	(4)	(4)	(4)	[5] 3,600
1963	(4)	(4)	(4)	(4)	[5] 5,200
1964	[2 7] 33	[7] 31	[8] 5.6	(4)	[5] 7,000
1965	---	(4)	[9] 6.6	[10] 100	[10] 7,500
1966	(4)	(4)	(4)	(4)	(4)
1967	(4)	(4)	(4)	(4)	(4)
1968	(4)	(4)	(4)	(4)	(4)
1969	(4)	(4)	(4)	(4)	(4)
1970	(4)	(4)	(4)	(4)	(4)
1971	(4)	(4)	---	[11] 600	[11] 20,000
1972	[12] 42.6	[12] 40	---	[13] 800	(4)
1973	[13] 44.0	[13] 41	---	(4)	[14] 30,000
1974	(4)	(4)	---	[10] 1,300	(4)

[1] These estimates were derived from percentages given in the survey of J. L. Buck as described in D. H. Perkins, "Agricultural Development in China, 1368–68" (Chicago: Aldine Press, 1969), p. 64.

[2] Approximately.

[3] State Statistical Bureau, "Ten Great Years," pp. 128 and 130.

[4] Indicates estimates not now available outside China.

[5] These figures were given to a Pakistani delegation and reported in S. J. Burki, "A Study of Chinese Communes 1965" (Cambridge: East Asian Research Center, 1969), p. 5.

[6] Data published for these years are unreliable because of the effect of the great leap forward on the State Statistical Bureau.

[7] Various Chinese statements in this period indicate that irrigated acreage was nearly 500,000,000 mou (33,000,000 hectares) or about one-third of total arable.

[8] "Peking Review," Oct. 8, 1965, p. 29.

[9] Chinese radio broadcast reported by British Broadcasting Corp., monitoring service, Jan. 5, 1966, p. A12.

[10] "Peking Review," Jan. 3, 1975, p. 11.

[11] According to a Dec. 31, 1972 New China News Agency report, 210,000 tube wells were sunk in 1972 (Foreign Broadcast Information Service, Jan. 9, 1973, pp. B5–6) The 20,000,000 figures is in FBIS, Oct. 23, 1974, p E1.

[12] The 1973 figures were given by the Chinese to a delegation of American water management specialists and given to me by Dr. James Nickum, a member of the delegation. The "Peking Review," Jan. 4, 1974, p. 10 says that between October 1972 and September 1973, 1,400,000 hectares of land were brought under irrigation through sinking more power-operated wells. I assumed that this figure was a rough approximation of the total expansion of cultivated acreage in that year. The resulting estimate is also consistent with a figure given by water conservancy officials given to another delegation of over 40,000,000 hectares in 1972.

[13] "Peking Review," Dec. 15, 1972, p. 15.

[14] "Survey of the China Mainland Press," No. 5705, Sept. 24, 1974. I am indebted to R. M. Field for this citation.

A more long-term (and more expensive) solution to the northern water problem is, as indicated above, to remove the silt from the Yellow River and from the other northern rivers. There is no easy or cheap way of accomplishing this removal. Basically what is involved is ending or greatly reducing erosion in the loess lands surrounding the upper reaches of these rivers. Elimination of erosion in turn involves massive reforestation, the planting of forage grasses, and the building of numerous large and small dams and related construction. Mobilization of large amounts of rural labor on a more or less volunteer basis can play a role in this process, but such labor cannot do the task alone. Many of the areas involved are lightly populated and the people in those areas often won't be the primary beneficiaries of these projects (i.e. they cannot be expected to volunteer in sufficient numbers and hence would have to be supplemented by paid workers brought in from long distances away).

When the process of silt removal is completed perhaps two decades hence, north China's water shortage problems will not be completely solved. The entire annual flow of the Yellow River is less than one-twentieth of that of the Yangtze and that of the Hai River is less than a third of that of the Yellow River.[19] Still the availability of large amounts of river water for irrigation purposes should make possible significant increases in nothern grain yields.

This discussion of China's water problem makes it clear that no rapid and easy breakthroughs are possible in this area either. Progress is both possible and likely in the area of water as it is in the area of fertilizer and improved seeds. Rather than some sudden surge in farm output that will reduce the need to be concerned with agriculture, however, China in the next decade will have to settle for slow and steady progress often at great expense and effort.

Incentives and Output

Up to this point, this analysis of Chinese agriculture has proceeded as if human beings were absent or could be treated as so much labor input. But human beings are not machines that operate efficiently if turned on and properly maintained. Human beings must be motivated to do what is right from an efficiency point of view.

This essay is not the place to get into all the complex issues that relate to the question of human motivation in the People's Republic of China. In particular, this essay is no place to attempt an appraisal of the impact of the Cultural Revolution on the willingness of the Chinese people to work for the good of society as a whole rather than for their own direct material gain. Nor is there space to attempt to even list all the various carrots and sticks available to China's leadership that can be used to influence individual behavior.

But this essay would be incomplete if some mention were not made of the very substantial investments made by China in the motivation of the rural population, investments that have involved the diversion of large quantities of real resources. Three deserve special mention: The

[19] These figures were supplied by Dr. Dean F. Peterson, a member of the 1974 American water management delegation to China, to the National Academy of Sciences Conference on Chinese agriculture, Feb. 20–21, 1975.

rise in farm purchase prices, the lack of increase in the agricultural tax, and the grain import policy.

During the war with Japan, the terms of trade between industry and agriculture moved against agriculture. After 1949, the Chinese government allowed these worsened terms of trade to persist into the 1950's preferring in late 1953 to introduce farm purchase quotas rather than allowing prices to rise sufficiently to extract the needed deliveries of farm products. But, as is apparent from the data in table 7, beginning in the late 1950's and continuing into the 1960's and 1970's farm purchase prices were allowed to rise while at the same time retail prices of industrial products sold to farmers held firm or declined. The 1930's terms of trade level recovered and was surpassed in the early 1960's if not before and agriculture's terms of trade have continued to improve slowly over the past decade.[20]

Most of the rise in rural income per capita over the past 20 years can be explained by this improvement in agriculture's terms of trade since farm output in constant prices has only managed to keep just ahead of population growth over this same period. This rise in per capita income has in turn been channeled in part into increased investment by communes and teams. In effect, the increase in rural investment in fertilizer and machinery was financed by the state not with commune subsidies, but by cuts in the prices of agricultural inputs and rises in the prices of agricultural output.

TABLE 7.—RURAL PRICE INDEXES

Year	Purchase prices of farm and sideline products (index—1952 =100)	Prices of industrial products sold in rural areas (1952=100)	Prices of means of production sold in rural areas (1952=100)
1950[1]	82.2	91.2	NA
1951[1]	98.3	100.5	NA
1952[1]	100.0	100.0	[2] 100.0
1953[1]	110.1	98.5	NA
1954[1]	113.8	100.2	NA
1955[1]	113.2	101.4	NA
1956[1]	116.6	100.4	NA
1957[1]	122.4	101.6	NA
1958[1]	125.1	101.0	NA
1963[3]	154.7	114.3	NA
1971[4]	156.2	114.0	NA
1973[5]	160+	NA	[2] 50.0

[1] State Statistical Bureau, "Ten Great Years", pp. 172-173.
[2] New China News Agency, Feb. 13, 1974 as reported by the BBC, p. AI.
[3] The percentage increase over 1951 is given in Peking Review, Nov. 20, 1964, p. 23.
[4] Peking Review, Oct. 6, 1972, p. 21 reports thot farm purchase prices rose 90 percent between 1950 and 1971 and that the parity rate between industrial and agricultural products in 1971 was 40 percent below 1950 and using this latter percentage I can derive the rural industrial product price index.
[5] Peking Review, Jan. 3, 1975 states that purchase prices were nearly double those of 1950 and the New China News Agency on Feb. 13, 1974 stated that purchase prices of farm products in 1973 were more than 60 percent above 1952.

Note: NA indicates that official estimates for these years are not presently available

The state did not pay for this diversion of resources by raising taxes paid by agriculture. As can be seen from the data in table 8, the agricultural tax as a percentage of crop output has declined steadily. If the definitions used in deriving the figures in table 8 have not changed

[20] Official Chinese estimates of the terms of trade between industrial and agricultural products was that the industrial index in 1952 was 21.8 percent above the level of the agricultural price index treating the 1930–36 average ratio of industrial to agricultural prices as 100 (N. R. Chen, *Chinese Economic Statistics*, p. 424).

over time, then not only the percentage share but the absolute level of agricultural tax may have declined.[21]

The largest tax charged to the agricultural sector by the state is the tax that represents the difference between the sales price of goods sold to agriculture and the cost of producing and marketing those goods. This tax, of course, has risen as retail sales have risen and has fallen whenever prices of producer or other goods sold to agriculture have been cut.[22] As a percentage of farm income, this tax (actually taxes) has probably fallen.[23]

Is there today any net drain of resources at all out of agriculture for the support of industry, the military, et cetera? To answer that question we would have to have an estimate of state expenditures on agricultural investment and rural social services. All we know is that the state over the entire 1953–71 period spent 23.4 percent more on agriculture than it received from the agricultural tax,[24] but we don't know just what this estimate includes. There is little doubt, however, that state investment in agriculture over and above what the communes invest in themselves is several times in both and real money terms the levels of the 1950's when it was only about 1,000 million yuan a year. Still, state expenditure in rural areas of around 5,000 million yuan a year would not be nearly enough to cover the agricultural tax plus the tax on industrial products sold to agriculture.

TABLE 8.—THE AGRICULTURAL TAX

Year	Agricultural Tax			
	In value terms (million yuan)	In fine grain equivalents (million metric tons)	As percent of agricultural crop output	
			Value calculation	Fine grain calculation
1952 [1]	3,776.0	19.403	11.70	13.2
1953 [1]	3,596.0	17.197	10.95	11.94
1954 [1]	3,767.0	18.573	11.15	12.43
1955 [1]	3,738.0	19.198	10.23	11.65
1956 [1]	3,526.0	18.347	9.00	10.76
1957 [1]	3,795.5	20.005	9.25	11.51
1970 [2]	NA	NA	NA	6
1972 [2]	NA	NA	NA	6
1974 [3]	NA	NA	NA	5+

[1] The 1952–57 figures are from Li Ch'eng-jui, "Chung-hua jen-min kung-ho-guo nung-yeh shui shih kao" (Peking: Finance and Economics Press, 1962), p. 189.
[2] "Foreign Broadcasts Information Service," Oct. 24, 1973, p. B1. The source also states that the rate in 1952 was 13.2 percent.
[3] Peking Review, Jan. 3, 1975, pp. 10–11.

Note: NA indicates that official estimates for these years are not presently available.

There is a conceptual problem as well in any attempt to measure the net drain of agricultural reources. The key issue is whether one treats as a tax the difference in price between what the farmer actually receives for his products and the higher prices he could have received on an uncontrolled market. If one does so, then one must add a substantial figure to the estimate of the tax burden in the early 1950's and

[21] If the ratio of all crop output converted into fine grain equivalents to unprocessed grain output was the same in 1972 in 1957 (when the ratio was 0.94) then the implied tax in 1972 would be 13.5 million tons in fine grain equivalents, down considerably from the levels of the 1950's indicated in table 8. With the rise in grain prices, however, the figure in money terms may be about the same as in the 1950's.

[22] Where cost reductions have occurred that have not been passed on to the consumer, one can also speak of a rise in the tax. The actual payment of the tax, of course, is made by the producing and marketing enterprises, not the rural purchasers.

[23] This statement follows if rural retail sales have not risen faster than farm income and the tax rate per dollar of sales has declined due to price cutting that is greater than the decline in costs of producing the goods sold.

[24] *Peking Review*, Dec. 15, 1972, p. 17.

must correspondingly reduce that additional tax as purchase prices have been allowed to rise.[25]

There is little point in pursuing this line of argument further here. Two points, however, are reasonably clear. On the one hand, there continues to be some net drain of resources away from agriculture to other uses. On the other hand, the drain has certainly declined when expressed as a percentage of farm income measured in current prices. There may even have been a significant reduction in this net drain in absolute terms as well. Whatever the precise figure, there is little doubt that the often stated shift in priorities implied by the term "take agriculture as the foundation" is reflected in substantial changes in the proportion of real resources flowing to and from agriculture.

Finally brief mention must be made of China's grain import policy. Chinese officials explain their grain import policy as an attempt to profit from high world prices for rice (which they sell) and low world prices for wheat (which they buy). This statement is true as far as it goes, but it is also misleading. The Chinese could benefit from high world prices without importing wheat. Furthermore, they import far more grain in both quantity and value terms than they export.

It is also misleading or incorrect to argue that China imports grain to ward off starvation and malnutrition. The amounts involved, about 5 million tons a year net, would have little impact on the national average level of grain consumption. Divided by a population of 800 million, this figure represents only 6 kilograms of grain per person per year or half a kilogram per month.

It makes more sense to view grain imports as another large investment in agricultural production incentives. Five million tons is a small fraction of total grain output, but it is a much larger proportion of the grain that is marketed and it is an even larger share of the grain that is marketed involuntarily. The last year for which we have official estimates of the grain deliveries (taxes plus purchases) is 1958 when the total passed 50 million tons of husked grain for the first time, up from 40 to 45 million tons during the First Five-Year Plan period (1953–57). Since 1958, grain deliveries undoubtedly fell sharply in the early 1960's and then recovered and surpassed previous peak levels as the urban population continued to grow.

There is no precise way of estimating the portion of these grain deliveries that was "involuntary." The concept is meant to cover grain deliveries over and above what farmers would sell of their own accord at existing purchase prices. In 1952–53 prior to the introduction of compulsory quotas, for example, Chinese peasants sold more than 10 million tons of husked grain over and above the 20 million tons of grain used to pay the agricultural tax. Today with purchase prices and incomes higher, that voluntarily marketed figure would presumably be considerably higher. To take a hypothetical but realistic example, if total grain deliveries today are 60 million tons and the voluntary portion is 30 million tons, then grain imports of 5 to 6 million tons a year represent upwards of 20 percent of the involuntary portion.

By spending large amounts of scarce foreign exchange on grain, therefore, the Chinese government is able to tell the production teams

[25] However, as rural and urban incomes have risen, a case could be made that the hypothetical uncontrolled market prices of farm products may also have risen in which case the tax as defined here would not have fallen necessarily.

that they can count on keeping a much larger portion of any increase in grain output achieved than otherwise would be the case. Grain imports, in effect, are what backstops government guarantees that grain tax and purchase quotas will not be raised frequently or by large amounts.

CONCLUSION

From the above discussion, it is clear that China's shift in priorities toward agriculture in the 1960's was both real and large in scale. Something like 10 billion yuan of resources a year were poured into agriculture over and above what would have occurred if the policies of the 1950's had continued in effect.[26] Producer goods and military related industries still received the lion's share of the State budget, but there is no doubt that agriculture's share rose dramatically.

This higher priority for agriculture could be seen in improved farmer incentives such as higher purchase prices and a declining agricultural tax. It could also be seen in the rapid development of the chemical fertilizer industry and the provision of pumps and well-drilling equipment to the countryside. And while the state's priorities were shifting toward agriculture. China's production teams and communes were continuing to invest heavily in themselves. Many of the resources going to the development of small-scale fertilizer and cement plants came from the rural areas and, in water conservancy and land improvement, it was the communes' own labor that was mobilized.

For all this outpouring of effort and resources, however, there was no enormous, leap in farm output. Agricultural production did rise, but at a rate only a little above population growth if the 1957–74 period is taken as a whole. Rural incomes per capita did rise by more than this, but mainly as a result of the improvement in the agriculture-industry terms of trade.

The main reason why agricultural growth has not been faster appears to be simply that China is attempting to achieve large farm output increases under basically unfavorable conditions. When land under cultivation cannot be extended except at enormous expense and when inputs of fertilizer, water, and labor are being intensively utilized, the return on further additions of these same inputs will not be high.

For the future, there is every reason to believe that Chinese agricultural output will continue to grow although no major breakthroughs appear to be in sight. To achieve this continued growth, however, some shift in emphasis in China's agricultural policies is probably necessary. The silt problem of China's northern rivers will have to solved. There will also have to be a considerable improvement in the quality of China's research in the basic sciences. These changes appear to be well within China's capacities and they are likely to be carried out if for no other reason than that China appears to have few other options. China is simply too big to follow the lead of Japan or Europe and rely increasingly on imports to meet its food needs.

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[26] This figure is a very rough approximation. It includes an estimate of increased investment in agriculture and rural services of 4 billion yuan, an increase in farmer purchasing power due to a rise in farm purchase prices of another 3 or 4 billion yuan a year or more, and lesser amounts representing the decline in the agricultural tax, the increase in grain imports, and investment in modern industries designed to support agriculture. In any figure of this sort, there are conceptual and empirical problems connected with deciding just what constituted a shift in state resources, what was a rise in the communes' own investment in themselves, et cetera. It is only the shift in state resources that we are trying to estimate here.

THE COMMUNE SYSTEM IN THE PEOPLE'S REPUBLIC OF CHINA, 1963–74

By FREDERICK W. CROOK*

I. INTRODUCTION

A. Summary

China's commune system consists of four parts: Commune; brigade; team; and household. This system, born in the optimistic fervor of the Great Leap Forward in 1958, was reduced to a skeleton during the lean years from 1959–62, but has developed greatly in the past 12 years.

Currently, China has 50,000 communes, about 25,000 less than the number in existence in 1963. Essentially the commune level functions as the basic unit of local government. This level is charged with the responsibility of procuring grain, collecting taxes, providing public security, and reporting statistics and information to higher levels. In addition, it formulates specific production plans for its subordinate units after adapting policies received from higher levels to local conditions. The commune also provides leadership for the management of water resources, construction, afforestation, and transportation projects which require the direction and control of a large organizational unit. Moreover, it manages local industries which produce consumer and producer goods for local consumption.

Brigades currently are estimated to number about 750,000. The brigade is the final link in the long chain of Government and Party control systems. It is the institution charged with overseeing the work of production teams. The bridgade has coercive power through its ability to nominate officials which lead teams. The Chinese Communist Party Branch in the brigade is responsible for inculcating socialist ideals in team officials and members. Moreover, brigades can influence team behavior because of the inputs, such as electricity, water, and farm machinery they control, and the social services, such as health and education, they deliver to or withhold from teams.

Production teams are estimated to number about 5 million. The team continues to be the most important formally organized unit in the commune system. This semiautonomous unit makes the final decisions regarding the production of goods and the distribution of income. It is the unit which bears the burden of calculating profits or losses. Most of the grain and foodstuffs grown in teams is consumed by member households with only a portion marketed. Aside from the household, no other institution in China so deeply affects every major aspect of the lives of China's rural population.

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Finally, households are estimated to number about 167 million. The household takes the responsibility for disciplining and motivating its labor force, and for distributing income to its individual members. Households continue to cultivate private plots from which come most of China's vegetables, poultry, and hogs.

Regarding similarities and differences in the commune system in various regions of China, two different patterns are evident. On the one hand, communes in various parts of the country have basically similar organizational structures, ownership patterns, and methods of distributing income. On the other hand, communes in different parts of the country vary greatly regarding numbers of brigades, teams, households, population, arable land, level of mechanization, and income.

The persistence of the team as the basic unit and similarities in organization and ownership patterns of contemporary communes with those in 1962 tend to mask important changes which have taken place in the past 12 years at commune and brigade levels. These levels provide more services, control more inputs, have better trained cadres and stronger Party organizations than they did in 1962. Indeed, there has been ideological pressure in the Party to abolish the team and amalgamate households directly into brigades bringing agriculture one step closer to ultimate socialization. This pressure, understandably, has been supported by poorer teams desiring to increase their share of collective income. However, pressure to change the status of teams has been arrested by the newly passed 1975 Constitution which specifically sustains the continued functioning of these units. Moreover, the requirements of China's labor intensive agriculture necessitates a unit similar to the team in size and organization, which can effectively manage and motivate the farmers of China to produce the foodstuffs needed for this country's huge and growing population.

B. Organization of Paper

The purpose of this paper is to describe communes as they exist and function at the present time, and to briefly analyze economic coordination and decisionmaking processes in the commune system. The scope of the paper is limited to the four levels of commune system in China's economy: i.e. the rural people's commune (RPC); the production brigade (PB); the production team (PT); and the household. Its major focus concerns the economic affairs, especially relating to agricultural production, of the units in the commune system, but of necessity some attention must be paid to education, politics, and health care as well. The study is limited to the 12-year period from January 1963 to December 1974.

In the early 1960's, within 6 to 7 years after the establishment of the communes, there were a series of excellent studies on these institutions by Professors Barnett, Donnithorne, Myrdal, Pelzel, and others. Several of these, including those by Barnett, Myrdal, and Pelzel, involved an indepth study of one agricultural unit, either a commune, brigade, team, or village.

This paper attempts to give a more nationwide perspective on the commune system in rural China. Primary and secondary source materials were used to collect information on commune organizations and related topics such as education, health, and marketing. The study rests primarily, however, on information gathered from approximately 1,400 individual reports on communes scattered over the broad expanse of China.[1]

Thus, while updating information gathered in the 1960's, this study should also allow for some analysis of regional variations and compilation of more aggregate data on the institutional structure of rural China.

Section II of the paper provides background information on the commune system as it was first organized in 1958 and as it was restructured from 1959 through the end of 1962. Section III outlines the main features of the commune system as its exists today and briefly describes the major changes which have occurred in the system since 1962. Section IV completes the discussion by presenting tentative ideas regarding (a) the coordination of economic activities of the separate parts of the commune system; (b) the constraints within which the production team, the most important unit in Chinese agriculture, makes economic decisions; and (c) prospects for change in the commune system in the next 5 years.

II. Organization and Restructuring of Commune System, 1958–62

Rural People's Communes were first organized in 1958 during the Great Leap Forward to resolve a number of problems in China's countryside. Tensions developed between collective farms (Advanced or Higher Agricultural Producers' Cooperatives) organized in 1956 and local hsiang governments regarding responsibilities and functions.[2] Chinese leaders found it difficult to improve both collective farm and hsiang administration at the same time because of the very limited numbers of well-trained persons in rural areas. Small-sized collective farms which were not directly controlled by the Party were felt by some Party leaders to be incapable of maximizing economic growth and initiating social and technological changes at the local level. Moreover, these small-sized production units were thought incapable of generating additional income to bridge the widening gap between rural and urban areas. Party leaders wanted to improve their control in rural areas and curb capitalist tendencies among the peasants. They wanted to create an environment in which a new kind of socialist person could be nurtured without contamination of strong material incentives, private plots, and feudal customs and practices.

The Central Committee of the Chinese Communist Party issued the "Resolution on the Establishment of Communes in Rural Areas" on August 29, 1958, which led to the establishment of 26,000 communes by the end of the year. The resolution stated that the basis for establishing communes was the development of an "overall and continuous leap forward in agricultural production in the whole country and the growing elevation of the political consciousness of the 500 million peasants."[3] The resolution declared that the small-sized collective

[1] See Appendix I for a detailed discussion of the sources used in writing this report.

[2] Prior to the formation of communes, China's rural administrative structure consisted of two levels, the hsien or county, and several subordinate units called hsiang.

[3] "Resolution of the Central Committee of the Chinese Communist Party on the Establishment of People's Communes in the Rural Areas," NCNA, Peking, Sept. 9, 1958; translated in SCMP, No. 1853, Sept. 15, 1958, p. 1.

farm "* * * with a few score or a few hundred households is no longer suited to the demand of the developing situation." [4]

Communes were designed to integrate all aspects of rural life including agricultural, subsidiary, and light industrial production; politics and administration; social services such as education, health, and welfare; transportation and communication; finance and commerce; water conservation and basic construction; and military affairs. The commune, roughly comparable in size to the hsiang in terms of households, replaced the hsiang as the basic administrative unit in rural China. With their larger size, communes were expected to mobilize underutilized factors of production, especially the labor force, to contract capital projects and to increase production and income.

Communes also were expected to accelerate the building of socialism and the gradual transition to communism.[5]

The production brigade and production team, which corresponded in size to the former collective farm and its production brigades, formed the middle and lower administrative levels of the commune. An organization chart of the commune system is presented on page 370. Attempts were made to reorganize households, the traditional basic unit in rural China, by providing communal living and eating quarters and distributing income directly to individuals rather than to household heads. Nonmaterial rather than material work incentives were stressed. Income was distributed partly on the basis of need through the supply system which guaranteed such things as food, clothing, shelter, and health care; and partly on the basis of labor through the payment of monthly money wages based on each farmer's wage rate per day and the number of days worked.

Communes organized as described above encountered numerous difficulties by December 1958. In fact, very few communes actually operated communal mess halls and nurseries, and for many communes the wage-supply system lasted only a few months. These difficulties have been well documented in works already published and it should be sufficient at this point to briefly outline the main problems and indicate the major organizational changes which took place.[6]

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[4] *Ibid.* P. 2.

[5] *Ibid.* For more detailed discussions regarding the establishment of communes see, A. Doak Barnett, *Cadres, Bureaucracy, and Political Power in Communist China*, New York, Columbia University Press, 1967, pp. 313–338; and Audrey Donnithorne, *China's Economic System*, New York, Praeger Publishers, 1967, pp. 43–64.

[6] See Kenneth R. Walker, "Organization of Agricultural Production," in Alexander Eckstein, Walter Galenson, and Ta-Chung Liu (ed.) *Economic Trends in Communist China*, Chicago, Aldine Publishing Co., 1968, pp. 440–452; and T. A. Hsia, *The Commune in Retreat as Evidenced in Terminology and Semantics*, Berkeley Center for Chinese Studies, Institute of International Studies, University of California, 1964.

ORGANIZATION OF A PEOPLE'S COMMUNE [1]

Level	Government		Party	State managed entities
	Member organization	Administration		
1. Commune	Commune people's congress.	Chairman [2]: Management (Revo utionary Committee [2]: 1. Administration. 2. Political and legal. 3. Culture, education and health. 4. Commerce. 5. Water conservancy. 6. Agriculture. 7. Forestry and animal husbandry. 8. Industry and commerce. 9. Military affairs.	Party secretary: Party committee: 1. Organization. 2. Propaganda. 3. Youth. 4. Women. 5. Military affairs. 6. Political.	Grain management office, tax collection office supply and marketing cooperative people's Bank.
2. Production brigade	Member congress	Brigade chief [2]: Management committee [2]: 1. Economic management. 2. Public security. 3. Cashier. 4. Accountant.	Party branch secretary: Branch committee: 1. Political. 2. Organization. 3. Study. 4. Youth. 5. Women. 6. Propaganda (party cell).	
3. Production team	Member congress	Team leader [2]: Team committee [2]: 1. Public security office. 2. Accountant. 3. Cashier. 4. Custodian.		

[1] See Chang Shu-chih, "Introducing a People's Commune," "Tsai ching yen chiu" (financial study), No. 6, Sept. 15, 1958; translated in "Extracts from China Mainland Magazines", No. 152, Jan. 5, 1958, pp. 21–22; also see A. Doak Barnett, "Cadres, op. cit.", pp. 339–362.

[2] Elected by members of commune, brigade and team congress of members.

Unlike the previous major agricultural changes of land reform and collectivization for which considerable experience was gained prior to full implementation, the Party organized communes rapidly without benefit of much prior experience.

Accounting and statistical systems failed to provide decisionmakers with information needed to make economic plans. Decisionmakers themselves were not prepared to operate such large institutions, especially with regard to managing agricultural production.[7] Expected organization economies through centralization of functions at the commune level did not materialize for some important functions such as the allocation of the labor force, and accumulation of capital. Prof. G. W. Skinner suggested in several important articles published in 1964–65 that newly organized communes encountered difficulties because they were not properly aligned with traditional rural institutions which had been shaped by decades and perhaps even centuries of rural marketing customs and practices.[8]

Work incentives reached a nadir in communes with the reduction of, and in some cases the elimination of, private plots and with the emphasis on nonmaterial incentives. Farmers saw little correlation between work done and payment for work in the wage-supply system. Furthermore, commune administrators did not appropriately reward farmers in villages which, either through efficient management or favorable endowments of fertile soil and water supplies, were much more productive than farmers in neighboring villages. Incentives declined for farmers in the more productive villages when they found the fruits of their labor, which had been fairly and honestly won, being distributed to other villages. Moreover, the formation of communes put additional strain on both cadres and farmers already weary of constant change for a decade, that is, land reform, collectivization, and finally communization. These difficulties plus poor weather led to declines in production which prompted Chinese leaders to reorganize communes.

In the space of 4 years, from spring 1959 to winter 1962, communes underwent two reforms. Beginning in spring 1959 and continuing throughout the year, communes began to make the brigade the basic unit of account. A three-level ownership system was instituted which made the brigade the most important production unit in the commune system. Most of the means of production were to be owned and controlled by the brigade and minor portions were to be controlled by the commune and teams.[9]

Experience proved that the brigade also was too large a unit to effectively manage and motivate farmers. The labor intensive nature of agricultural production in China required that commune institutions pay particular attention to the management, allocation, and motivation of the labor force. In the end it was found that small-sized teams of

[7] See Frederick W. Cook, "Rural Labor Recordkeeping in China, 1952–1970," U.S. Bureau of the Census, Unpublished Report, Washington, D.C. 1971.

[8] See G. W. Skinner, "Marketing and Social Structure in Rural China," *Journal of Asian Studies*, vol. XXIV, No. 3, May 1965, p. 394.

[9] "Resolution of 8th Plenary Session of 8th CCP Central Committee on Production Increase and Economy Campaigns," NCNA, Peking, Aug. 25, 1959; translated in CB No. 589, Sept. 1, 1959, pp. 4–10.

20–30 households could best manage and motivate the rural labor force and, beginning in 1961, teams were made the basic unit. Teams were given ownership and control over most of the agricultural means of production. Economic decisions were implemented at the team level and teams distributed income and calculated profits or losses.[10]

Instead of centralizing all functions at the commune or brigade level, the commune system was reorganized so that functions requiring large-scale management were aligned with institutions having the capability to most effectively manage that function. Functions such as coordination of production, control of water, agricultural extension, and certain kinds of health activities were allocated to the commune. Small-sized water conservation projects, primary education (after 1968) and certain kinds of subsidiary production were allocated to the brigade. The function of managing the labor force to raise the bulk of China's agricultural crops was given to the team. Finally, certain functions, such as the raising of specific kinds of livestock, were allocated to households.[11]

By the end of 1962, incentives increased with the return of private plots and the reestablishment of material rewards. The closer correlation between pay and work done was achieved through the rejuvenation of the old collective farm labor day work payment system.[12]

A December 1962 interview with an average farm family regarding its relationship with these rural institutions during the preceding 13-year period, would reveal that the family had first joined a seasonal mutual aid team which, in time, was merged with an adjacent team to form a permanent mutual aid team. The household next joined a semi-socialist agricultural producers cooperative (APC) which in 1956 was merged with other APC's to form a collective farm. In fall 1958 the family's collective farm became a brigade in the newly formed commune. From the family's point of view, their earnings came initially from the commune which was the basic accounting unit. Then in 1959 they received income from their brigade which had become the unit of account. Finally, the small neighborhood team became the unit of account in 1961. For a single family, specific dates can be pinpointed regarding changes in structure, but for the country as a whole it is well to remember that these changes occurred over a month, season or even a year's time. Likewise, the number of communes increased gradually from 26,000 in 1961 to 74,000 in 1963. Table I summarizes developments in "socialist" agricultural units in the People's Republic of China (1950–62).

[10] Chinese Communist Party Central Committee, "Nung-ts'un jen-min kung-she t'iao-lieh (hsiu-cheng ts'ao-an)" (Revised Draft Regulations Governing Rural People's Communes"), September 1962.

[11] Prof. Joan Robinson was one of the first scholars to see the distribution of various functions to the four basic units. See Joan Robinson, "Organization of Agriculture," in Ruth Adams (ed.), *Contemporary China*, New York, Vintage Books, 1966, pp. 221–234.

[12] Charles Hoffman, *Work Incentive Practices and Policies in the People's Republic of China, 1953–1965*, Albany, N.Y., State University of New York Press, 1967.

TABLE I.—DEVELOPMENT OF SOCIALIST AGRICULTURAL UNITS IN THE PEOPLE'S REPUBLIC OF CHINA, 1950–62[1]

Year	Seasonal mutual aid teams [2]	Permanent mutual aid teams [2]	Semi-socialist APC's	Collectives	Rural people's communes	State farms [3]	Percentage of peasants households in socialist agricultural units [4]
1950	2,097,000	627,000	18	1	(5)	NA	10.7
1951	3,600,000	1,075,000	129	1	(5)	NA	19.2
1952	6,270,000	1,756,000	3,634	10	(5)	404	40.0
1953	5,634,000	1,816,000	15,053	15	(5)	NA	39.5
1954	6,130,000	3,801,000	114,165	201	(5)	NA	60.3
1955	3,975,000	3,172,000	633,213	529	(5)	NA	64.9
1956	(5)	(5)	682,000	312,000	(5)	NA	96.3
1957	(5)	(5)	[6] 72,022	[6] 680,081	(5)	710	[7] 97.0
1958	(5)	(5)	(5)	(5)	[8] 26,578	1,442	[8] 99.1
1959	(5)	(5)	(5)	(5)	[8] 24,000	NA	NA
1960	(5)	(5)	(5)	(5)	NA	[9] 2,490	NA
1961	(5)	(5)	(5)	(5)	[10] 26,000	[11] 2,5C0	NA
1962	(5)	(5)	(5)	(5)	NA	NA	NA

[1] All sources except those specifically marked are from China's State Statistical Bureau, Agricultural Statistics Section, "Statistical Data on Agricultural Cooperativization and the Distribution of Income in Agricultural Producers' Cooperatives in 1955," Peking, 1957, pp. 9–11.

[2] Single totals were given for mutual aid teams in 1950, 1951, and 1952. These totals were allocated to seasonal and permanent teams in the same proportion as in 1953.

[3] State Statistical Bureau, "The Ten Great Years—Statistics on Economics and Cultural Achievements in the People's Republic of China," Peking, 1960, p. 134.

[4] Ibid., p. 35.

[5] Not applicable.

[6] "China's APC's Achieved Great Results in Past Six Months," Peking, translated in SCMP, No. 1573, July 19, 1957, pp. 23–25.

[7] Op. cit., "Ten Great Years," p. 43.

[8] Chia Ch'i-yun, director of State Statistical Bureau, "Superiority of People's Communes Analyzed," NCNA, Sept. 25, 1959; translated in SCMP, No. 2107, Oct. 1, 1959, pp. 34–36l.

[9] Leslie T. C. Kuo, "The Technical Transformation of Agriculture in Communist China," Washington, D.C., Frederick A. Praeger, 1972, p. 41. See Wang Chen, "Strengthening the Construction of State Farms," H C 66, Peking, No. 7, No. 7, 1961, pp. 1-7.

[10] Lo Keng-mo, "The Nature of Rural People's Communes at Present," "Kung-jen jih-pao" (Workers Daily), July 19, 1961, p. 3.

[11] Audrey Donnithorne, "China's Economic System," New York, Praeger Publishers, 1967, pp. 94–95. See Peking Review, July 28, 1961, p. 4.

Note: NA means not available.

III. The Commune System Since 1962

There appear to be three distinct trends regarding change in the commune system in the past 12 years.[13] On the one hand, the main features of the system, the ownership patterns, incentive systems, and organizational structures are much the same as they were 12 years ago. On the other hand, in the past 12 years, much change has occurred filling out the basic systems laid out in 1962. Important changes include: The establishment of revolutionary committees during the Cultural Revolution; increased industrial and subsidiary production activities; establishment of a rural health system; improvement in the rural education system; improved rural mechanization through construction of an electrification network, the establishment of tractor stations and shops to manufacture and repair farm machinery; expansion of the agricultural extension system, and improvement in scientific experiment work in rural areas; greater involvement in managing the retail trade of the supply and marketing cooperatives; and the establishment of a rural broadcasting system. Finally, the third change con-

[13] This portion of the paper rests on three types of information. The first, is that work done by Professors Barnett, Myrdal, Pelzel, Vogel and others. Their information was gathered first-hand in China, or was gained from Chinese refugees. This information, however, is limited primarily to the period 1962–65, prior to the Cultural Revolution (1966–69). The second source is the 1,400 reports on communes as described in Appendix I, gleaned from Chinese news releases of the past 12 years. Finally, the third source is more general information gathered from the Chinese press regarding commune structure, organization and functions, but not dealing with specific communes.

cerns the fact that the number of communes was reduced about one-third from about 74,000 in 1963 to about 50,000 in 1973.

The discussion of each of the four units in the commune system will be organized as follows. First, as appropriate, size, organization, and ownership patterns in communes, brigades, teams, and households will be discussed. A review of the 1,400 reports revealed that most units had remarkably similar organizational structures. However, the size of the units in terms of arable land and population varied greatly from one commune to another. Consequently an effort will be made first to describe what might be called an average unit, and then, as is appropriate, regional variations will be discussed. Second, activities and functions undertaken by each of the four units will be discussed. Here an attempt will be made to clarify: (1) Which activities and functions are undertaken by each unit; (2) which functions are undertaken solely by one unit; and (3) which functions are shared. Generally, three kinds of activities or functions will be discussed: (1) Administrative activities—Government, Party, and military; (2) production activities—agriculture and industry; (3) service activities—health, education, and agricultural extension.

Third, and finally, relationships between units will be discussed. Relationships among units in China's rural economy can be described as: (1) Those relations between a unit in the commune system and an institution outside the system; (2) those relations between a superior and a subordinate unit in the system; and (3) those horizontal relations between units at the same level in the commune system. Where appropriate, income distribution will be discussed as an important part of the connection between units.

A. Commune Level

1. SIZE AND ORGANIZATION

Communes at present are estimated to number about 70,000. In the period under study various sources reported the number of communes as follows:

1963 [1]	74,000	1969	([3])
1964 [2]	74,000	1970 [6]	51,000
1965	([3])	1971 [7]	70,000
1966 [4]	70–80,000	1972	([3])
1967	([3])	1973 [8]	50,000
1968 [5]	75,000	1974	([3])

[1] Liao Lu-yen, "Collectivization of Agriculture," *Peking Review*, No. 44, 1963; in SCMM, No. 371, Nov. 1, 1963, pp. 21–32.

[2] Liu Kuo, "74,000 People's Communes in China," TKP, Sept. 17, 1964; translated in SCMP, No. 3307, Sept. 29, 1964, pp. 14–16.

[3] Means not available.

[4] "The People Who Run China's Rural Communes," New China News Agency, Peking, Mar. 22, 1966; in SCM, No. 3665, Mar. 25, 1966, pp. 28–31.

[5] Ian Davies, "The Chinese Commune—An Australian Student's View," EH, vol. VIII, No. 1, 1969, pp. 34–44.

[6] *She-hui fa-chan shih (History of Social Development)*, Shanghai, Shang-hai jen-min ch'u-pan she, December 1974, p. 340. Premier Chou En-lai told Edgar Snow in 1970 that there were some 70,000 communes in China. Edgar Snow, *The Long Revolution*, New York, Random House, 1972, p. 138. This is an obvious discrepancy from the figure cited in the *History of Social Development* and consequently has been supplanted by the more official figure for purposes of this study.

[7] Paul G. Pickowicz, "Barefoot Doctors in China: People, Politics and Paramedicine," EH, vol. XI, No. 5, 1972, p. 29.

[8] "Growth of Commune Clinic Shows Emphasis on Rural Health," New China News Agency, Peking, in English, June 25, 1973; in FBIS, *Daily Report: People's Republic of China*, No. 123, June 26, 1973, p. B–1.

Between 1961 and 1963 commune numbers increased 185 percent, from 26,000 to 74,000, a number which remained fairly constant until the mid-1960's. Information recently received from China indicates that at some period prior to 1970, mergers took place which reduced commune numbers from about 75,000 to about 50,000. For example, a recent officially published book "History of Socialist Development" (December 1974) indicates that in 1970 commune numbers were approximately 51,000, and an article on rural health recently noted that there were 50,000 communes in China.[14] At present details are not available regarding the nature, or the timing of these mergers. It should be pointed out, however, that selected communes could be dissolved into component parts and integrated into adjacent communes without greatly disrupting rural administration or production.

The average commune in 1970, according to the History, had about 2,900 households, 13,000 persons, and 5,400 labor force units.[15] The average commune for 1970 is not greatly different from an estimate made of the average commune in 1974 (see appendix II for details regarding the data, estimates, and assumptions used in calculating average commune size. The average commune in 1974 had 15 production brigades and 100 production teams. It contains about 3,346 households with a population of about 14,720 persons, and has about 2,033 hectares (5,024 acres) of arable land.

The number of brigades and teams varied widely from one commune to another. Some localities reported communes had organized only production brigades which had no production teams. A commune in Honan Province which had both brigades and teams reported the largest number of brigades at 38.[16] A commune in Kwangtung Province reported the largest number of production teams at 558.[17]

Researchers writing about communes in the first half of the 1960 decade noted the great variation in the size of communes from place to place.[18] Information gathered in this study verifies that these variations continue up to the present time. Data from selected geographic regions illustrates these variations in terms of average number of brigades and teams per commune as follows: [19]

Geographic region	Average number of brigades			Average number of teams		
	Province	Region	Hsien	Province	Region	Hsien
Heilungkiang:						
Wang K'uei Hsien			9.8			73.4
Kiangsi:						
I Ch'un Region		5.8			55.6	
Kwangtung	12.5			275		
Lu Ting Hsien			13.8			213.6
Shensi:						
Sian		16.6			74.7	
Szechwan	8.9			60.6		

[14] *She-hui fa-chan shih (History of Social Development)*, Shanghai, Shang-hai jen-min ch'u-pan she, December 1974, p. 340. "Growth of Commune Clinic Shows Emphasis on Rural Health," NCNA, Peking, in English, June 25, 1973; in FBIS, *Daily Report*. No. 123, June 26, 1973, p. B–1.

[15] Ibid. *History of Social Development*, p. 340.

[16] "Pioneering Central China People's Commune Advances—Report of Visit to Cliying People's Commune, Part One." NCNA, Peking in English, Aug. 7, 1973; in FBIS, *Daily Report: People's Republic of China*, No. 157, Aug. 14, 1973, D–3, pp. D–3 to D–6.

[17] "Szushui Commune Organizes Social Forces to Deliver Publications," *Yang-ch'eng wan-pao*, Canton, Oct. 13, 1965; translated in SCMP, No. 3570, Nov. 2, 1965, pp. 9–10.

[18] Audrey Donnithorne, *China's Economic Systems, op. cit.*, pp. 50–52.

[19] Data in this table was taken from table II, 386–387.

It can be seen that brigades per commune range from 5.8 in I Ch'un Region to 16.6 in Sian Region. Teams per commune range from 55.6 in I Ch'un Region to 275 in Kwangtung Province.

To highlight differences in commune size and to indicate differences between rural areas and suburban areas, an attempt was made to aggregate reports on individual communes for Hopeh, Kwangtung, and Shansi Provinces. Hopeh Province was chosen as a northern province which has large urban centers, Peking and Tientsin, and which is adjacent to the sea. Kwangtung Province was chosen as a southern province which has large urban centers, Canton and Swatow, and which is also adjacent to the sea. Shansi Province was chosen as an inland province which has Taiyün as its large urban center. The provinces were also chosen because of availability of data. Data on commune size in terms of population, households, and arable land were aggregated for rural and urban areas for the three provinces as follows:

	Number of persons		Number of households		Hectares of arable land	
	Rural	Suburban	Rural	Suburban	Rural	Suburban
Hopeh	[6] 14,591	[12] 48,250	[7] 5,410	[8] 9,800	[7] 2,853	[9] 6,788
Shansi	[8] 12,343	[2] 25,500	[2] 2,293	[1] 4,960	[8] 2,606	----------
Kwangtung	[5] 21,005	[25] 49,279	[2] 11,000	[15] 12,175	[4] 3,076	[14] 4,332

Postscripts indicate the number of commune reports employed to obtain an average. These figures should be used with great prudence because commune reports from different time periods were averaged, and because of the limited number of observations from some regions.

Nevertheless, the figures can be used to illustrate some basic trends. The figures indicate what has been suspected by scholars for many years, that suburban communes are larger than rural communes and therefore are not representative of communes throughout the country. Because most first-hand information has come from the visits of foreign guests to suburban communes near large urban centers, such as Peking, Shanghai, and Canton, such information should not be accepted as typical of the commune system throughout China. The rural communes have one-half to two-thirds fewer people, less land, fewer tools and less per capita income. Commune size was also found to vary considerably among different provinces. For example, Kwangtung's rural communes are considerably larger than those in Hopeh, and Hopeh's communes are larger than those in Shansi.

Concerning the relationship between natural villages in China and units in the commune system, this study found no set pattern. In some communes natural villages seemed to be associated with brigades. For example, a commune in Honan Province had 38 brigades and 38 natural villages, and a commune in Shansi had 18 brigades and 20 natural villages.[20]

In other communes natural villages were associated with teams. For example, a commune in Liaoning Province had 72 natural villages and

[20] "Pioneering Central China People's Commune Advances—Report of Visit to Chiliying People's Commune (one)," NCNA, Peking, in English, Aug. 7, 1973; FBIS, *Daily Report: People's Republic of China*, No. 157, vol. I, Aug. 14, 1973, p. D–3. Also see "A Visit to the Hsiao P'ing Yi Commune at Harvest Time," HC, No. 19, Oct. 1, 1963; translated in SCMM, No. 387, Oct. 22, 1963, pp. 5–13.

72 teams,[21] a Kirin commune had 211 villages and 200 teams,[22] and a Hopeh commune had 116 villages [23] and 125 teams.[24] In still other communes, brigades were found to have large numbers of villages. For example brigades from the following provinces had the indicated number of villages: Fukien, 75; [25] Kwangsi, 55; [26] Shansi, 44; [27] Honan, 32; [28] and Kiangsi, 20.[29]

Institutions and structures at the commune level at the present time are similar to those noted in the organization chart on page 370. Evidence collected for the report indicates that ownership patterns still continue in the form of the three-level ownership system established in the early 1960's. Mention should be made that some brigades already have been made the basic unit of account, see page 388. Moreover, it should be noted that a very small number of communes also are basic accounting units. Nevertheless, the recently convened National People's Congress (NPC) stipulated in the 1975 Constitution that collective ownership patterns in communes "generally take the form of three-level ownership with the production team at the basic level, that is, ownership by the commune, the production brigade and the production team, with the last as the basic accounting unit." The fact that this article was made part of the Constitution suggests most communes were organized as stated and that for the time being there are no immediate plans to change the structure of ownership or organization.[30]

It was not possible to determine from evidence currently available what proportion of assets in the commune system is owned by each of the four units. It is clear that the team continues to own the predominant share. On the other hand, because of the increased activity of commune-owned industry, the commune's share of total assets has increased in the past 12 years. For example a Red Flag article recently disclosed that commune and brigade shares of the ownership of fixed assets and shares of total commune income in suburban Shanghai communes increased in 1974 as follows: [31]

[In percent]

	1973, income	1974 Income	1974 Ownership
Commune	28.1	30.5	34.2
Brigade	15.2	17.2	15.1
Team	56.7	52.3	50.7

[21] Shahid Javed Burki, *A Study of Chinese Communes, 1956*, Harvard East Asian Monograph, 29, 1969 (1967?), pp. 64–67.
[22] *Ibid.*, pp. 72–74.
[23] *Ibid.*, pp. 50–53.
[24] "New Commune Members on Maochiashan Hill," CR, vol. XXIII, No. 10, October 1974, pp. 32–39.
[25] "East China Production Brigade Wins High Grain Yield in Transforming Nature," NCNA, English, Foochow, Aug. 28, 1970; in SCMP, No. 4733 (?), Sept. 4, 1970, pp. 125–126.
[26] "New Steel-Making Record at Anshan," NCNA, English, Anshan, May 23, 1965; in SCMP. No. 3466, May 27, 1965. pp. 10–11.
[27] "North China Model Production Brigade Makes Continuous Advances," NCNA, in English, Taiyuan, Jan. 6, 1971; in SCMP, No. 4819, Jan. 14, 1971, pp. 98–99.
[28] " 'Revolutionary House Keeper,' of Poor and Lower-Middle Peasants," NCNA, in English, Changshow, Oct. 22, 1969; in SCMP, No. 4526, Oct. 29, 1969, pp. 15–18.
[29] "Running Purchase and Marketing Posts Well in Accordance with Chairman Mao's Revolutionary Line," Peking, JMJP, Apr. 11, 1969; in SCMP, No. 4400, Apr. 23, 1969, pp. 7–9.
[30] "Constitution of People's Republic of China," NCNA, in English Peking, Jan. 19, 1975; in CB, No. 1024, Jan. 31, 1975, pp. 14–25, Article 7.
[31] Chang Ch'un-ch'iao, "On Exercising All-Round Dictatorship Over the Bourgeoisie," HC, No. 4, April 1975.

2. FUNCTIONS AND ACTIVITIES AT COMMUNE LEVEL

a. Administration

Commune, Government, and Party entities continue to cooperate together to provide a unified administration for commune functions. As before, communes continue to have congresses (meetings of members or meetings of member representatives) which elect the commune chairman, deputy chairman, and members of the management committee. Since the publication of the 1975 Constitution, these people's congresses of rural people's communes are now considered to be "local organs of state power" which are to be elected every 2 years.[32]

Management committees function as quasi-official local governments with various departments organized as indicated in the organization chart on page 370. The normal functions of the management committee were disrupted temporarily in some communes during the Cultural Revolution in 1966–70 when revolutionary committees were established. These committees integrated Party cadres, military persons, workers, and peasants to plan, coordinate, and manage the commune. The committees blurred the lines demarcating government and Party institutions. Since the Cultural Revolution, however, the "revolutionary" committees have been separated from Party institutions and have taken over the functions of the old commune management committees. Once again there is a distinction between government and Party institutions. The 1975 Constitution changed the name of the commune management committee, which functioned for many years as a quasi-official government institution, to revolutionary committee and stipulated that the new committee is to be the permanent organ of the commune people's congress and, at the same time, to serve as the local people's government.[33] Commune revolutionary committees are accountable to the commune people's congress and the revolutionary committees at the hsien (county) level.

Committees of the Chinese Communist Party continue to be centered at the commune level and they continue to be the most important institution of power in the countryside. These committees interpret policy decisions made in Peking, adapt policies as necessary to local conditions, and insure that policies and production plans are implemented. As was the case in 1962–65, responsible persons continue to hold two jobs, one in the Party and the other in the commune management committee. For example the deputy secretary of the Party Committee of the Hsin Tien Commune in Fukien Province, also serves as the director of the communes' military affairs department.[34] One indication that the commune Party secretary continues to be the top local leader concerns the fact that when domestic and foreign correspondents visit communes, more often the Party secretary addresses them than the commune chairman.

Both Party and commune officials have offices in the commune headquarters which might be located in an old abandoned temple, a landlord's villa, a store, or even a group of new office buildings. These com-

[32] *Ibid.*, article 21.
[33] *Ibid.*, article 22.
[34] "NCNA Tells About Militiamen on China's Coastal Front," Peking, New China News Agency, in English, Sept. 26, 1974; in Foreign Broadcast Information Service, *Daily Report: People's Republic of China*, No. 189, Sept. 20, 1974, pp. 5–6.

mune centers are usually located in one of the large villages within the commune, or in one of the old market towns serving the community.

In addition to their many other duties, Party leaders at the commune level exercise control over the commune level militia organization, as the Party Secretary or deputy secretary often functions as a political commissar in the militia unit.[35] The military affairs section of commune management committee also receives direction from hsien level military authorities. Militia regiments or battalions are usually organized at the commune level and are responsible for giving direction and training to subordinate company and platoon units. Militia units function primarily to provide public security in the commune.[36] Additional duties include serving as a firefighting force, as a rescue and relief force in natural disasters and as shock troops in carrying out dangerous [37] or difficult water conservation [38] or agricultural production assignments.[39]

The commune congress, management (revolutionary) committee, and Party committee work together to govern the commune and to coordinate its economic activities. Government administrative services provided by the commune include collecting taxes, maintaining public security, collecting data, and writing official reports, and preserving and enhancing the growth of socialism. Commune administrative organs receive state plans from higher levels and allocate production targets to subordinate units. They work with lower levels to make realistic plans and then encourage lower units to fulfill the targets.

These entities promote and exercise control over commune industries. They also manage large-scale water conservation projects. Finally, these organs coordinate the production and service activities which will be discussed below. In general these institutions function today much the same as Professors Barnett and Donnithorne described in their work on commune systems for the period 1962–1965.[40]

b. *Production*

The commune level engages in agricultural as well as industrial production though it does not produce a significant portion of basic agricultural commodities because the team owns and controls most of the labor and land. Commune agricultural production is limited mainly to activities such as fishing, forestry, animal husbandry, and cultivation of fruit orchards.[41 42 43]

Communes are far more important with respect to the development of rural industries. Most well known of course were their attempts during the Great Leap Forward to use farmers to produce grain from

[35] "NCNA Tell About Militiamen on China's Coastal Front," Peking, NCNA in English, Sept. 26, 1974; in FBIS, *Daily Report: People's Republic of China*, No. 189, Sept. 20, 1974, pp. 5–6.

[36] *Ibid.*, also see "Women Gunners on the South China Sea Front," C.R., vol. XVIII,

[37] "Heroic Militiamen Put Out Forest Fires," NCNA, Wuhan, in English, May 12, 1968; in SCMP, No. 4180, May 17, 1968, pp. 18–20.

[38] "Advancing in Spirit of Tachai Model in China's Agriculture," NCNA, in English, Changsha, Jan. 15, 1970; in SCMP, No. 4581, Jan. 21, 1970, pp. 67–69.

[39] For additional reading on militia, see George P. Jan (ed.), Government of Communist China, San Francisco, California Chandler Publishing Company, 1966, pp. 535–542; and John Gittings, *The Role of the Chinese Army*, London, Oxford University Press, 1967.

[40] A. Doak Barnett, *Cadres, op. cit.*, pp. 339–363; and Audrey Donnithorne, *China's Economic System, op. cit.*, pp. 43–64.

[41] "Visit to Double Bridge Commune," 1974, unpublished notes.

[42] Lucybeth Rampton, "Governors' Visit to the People's Republic of China," May 1974, Personal Journal, p. 29.

[43] "In the Communes—Ownership on Three Levels," CR, vol. 22, No. 1, 1974, pp. 35–38.

fields and steel from backyard furnaces. As has been well documented, the backyard blast furnaces produced low-quality high-cost steel. The shutdown of the small furnaces was dramatic and well-remembered. What has not been so well publicized is that in the past 12 years communes have been quite successful in developing a host of rural industries.

A survey of the materials collected for this study indicates that the following industries are most often found at the commune level: Grain processing (rice and flour) mills; farm implement construction and repair shops; edible oil presses; and brick, tile, and lime kilns. More specialized regional industries based on local natural resources, crops, and animals include: Hydroelectric generation; processing of hemp and cotton; dairy; timber; stone quarries and small coal mines; sugarcane presses; and production of cement. Less widespread among communes are industries such as chemical plants, boatbuilding shops, fruit canneries, starch and paper factories. Also light industrial and consumer products such as light bulbs, shoes, firecrackers, and porcelain and jewelry for export are produced in commune factories.

Tractor stations once again are being established at the commune level. According to Professor Donnithorne, stations were transferred from county levels to communes in 1958–59, but because of a lack of trained staff, management difficulties, and lack of funds, these stations reverted back to the county level in 1960–62.[44]

Evidence collected for this study suggests that, especially since 1969, communes have begun to establish their own tractor stations.[45] [46] It was not possible to learn from the data given what proportion of communes had tractor stations. The evidence, however, clearly suggests that a greater number of communes have farm machinery construction and repair shops than tractor stations.[47]

Increasing numbers of communes surveyed in the late 1960's and early 1970's cited the use of electrical power in grain, fiber, and oilseed processing, and in pumping water. Some communes have built their own small hydroelectric generating stations. The existence of tractor stations, machine shops, and electrical systems at the commune level should not give the reader the impression that Chinese agriculture is highly mechanized as these stations and shops at present are a thin veneer spread over an immense agricultural area. Nevertheless, great progress has been made and the new generation of young Chinese farmers are learning to use mechanical tools which will increase their productivity.

It also would be incorrect to leave the impression that China's countryside consists of 70,000 mini-Pittsburghs. Rural industry such as grain, fiber, and edible oil processing has gone on in China for centuries. Travelers from more industrialized countries sometimes describe China's countryside as lacking mechanization and modern industry. What has changed in the last decade is that the commune

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[44] Audrey Donnithorne, *China's Economic System, op. cit.*, p. 60.

[45] "Build the Commune Tractor Station Into a Big School of Mao Tse-tung's Thought along the Road of the "May 7" Directive," NYCW, No. 9, 1968 Supplement; translated in SCMM, No. 632, Oct. 28, 1968, pp. 21–24.

[46] "It Is Good for Tractors To Revert to Chairman Mao's Revolutionary Line," NYCW, No. 10, Oct. 8, 1968; translated in SCMM, No. 643, Feb. 3, 1969, pp. 17–26.

[47] Yuen Sheng, "Small Rural Hydropower Stations," CR, vol. XXI, No. 5, May 1972, pp. 34–35.

system has allocated resources and technical skills to rural industries, and these now are applying mechanical power and machinery to old jobs, and some new industries have been added. Also the commune system enables managers to mobilize underemployed labor during slack farming seasons to work in some of these rural industries.

c. Services

As far as service functions are concerned, communes today continue to have responsibility for health services. Since 1962 and particularly since the beginning of the Cultural Revolution, communes have worked diligently to implement Chairman Mao's dictum, "in health work, put the stress on the rural areas." [48] In 1973, Peking claimed that "nearly" every commune in the country had a clinic.[49]

About one-third of these clinics are funded by the state and the remaining two-thirds by communes. Half of China's professional medical workers are reported to be working in these clinics.[50] Clinics differ regarding numbers of beds, services, and equipment available to patients. The more fortunate have more than 20 beds, 10 "doctors" and 10 nurses, provide surgical services and have X-ray equipment.[51] Clinics at commune levels direct the functions of brigade level health stations and the activities of the "barefoot doctors." Clinics also direct birth control efforts and public health programs.[52]

The rural health system is not without problems, i.e., finding trained personnel and funds to support the program.[53] Despite these problems, however, Chinese farmers for the first time in history are now able to receive some medical attention. Granted that the treatment provided may be less than satisfactory, but some treatment is a vast improvement over the previous lack of medical care.

Commune Departments of Culture, Education, and Welfare continue to be responsible for the ducation system which includes secondary and special schools at the commune level and primary schools at the brigade level.[54]

During and after the Cultural Revolution commune members were encouraged to take control of, fund, and manage existing schools and to organize various kinds of schools to fit the needs and resources of the local community.[55] In the past 12 years progress has been limited by the dearth of well-trained teachers and funds. In spite of its failings, however, the commune education system has given an increasing number of Chinese young people a chance to obtain a basic education.[56]

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[48] "Rapid Growth of Commune Clinics in China," NCNA, in English, Peking, June 25 1973: in SCMP, No. 5409, pp. 167–169.

[49] *Ibid.*

[50] *Ibid.*

[51] "Co-op Medical Care in Sun Village," CR, vol. XXI, No. 11, November 1972, pp. 2–7.

[52] See Robert M. Worth, "Health and Medicine." in Yuan Li Wu (ed.) *China: A Handbook*. Great Britain. David and Charles. 1973, pp. 657–668.

[53] See David M. Lampton, "Trends in Health Policy," CS, vol. XII, No. 6, June 1974, pp. 1–8.

[54] A. Doak Barnett, *Cadres, op. cit.*, p. 354.

[55] See 16 reports on rural education published in the *People's Daily*, October–November 1968, translated in "Investigation Reports on Revolution in Rural Education," No. 868, Dec. 31, 1968, pp. 1–75.

[56] See Marianne Bastid, "Economic Necessity and Political Ideals in Educational Reform during the Cultural Revolution," CQ. April–June, 1970, No. 42, pp. 16–45; and Peter J. Seybolt, "The Yenan Revolution in Mass Education," CQ, October–December, 1971, No. 48, pp. 664–669.

Agricultural extension programs were generally available only in advanced communes at the beginning of the period according to Professor Donnithorne.[57] A survey of communes and literature since the mid-1960's, however, suggests that most communes now have active extension programs, and possess demonstration or experimental farms.[58] [59]

The commune, aided strongly by the State, continues to provide rural marketing services. These services include sales of consumer goods to farmers; sales of producer goods to brigades, and teams; and purchase of goods produced by units in the commune system.[60] Two categories of goods are purchased by the State. First category goods consist of the rationed commodities of grain, cotton, and edible oilseeds. Production teams producing rationed goods in excess of their needs are required to sell a fixed percentage of these goods to State purchasing stations at State controlled prices. In addition, the State rewards those teams producing goods above their own needs and above their procurement quotas by offering to purchase their excess products at higher than normal purchasing prices.

Second category goods consist of items not rationed but nevertheless in demand for domestic consumption and needed for export to earn foreign exchange such as pigs, poultry, eggs, nuts, and fruit. Purchases of second category goods are made for the State by supply marketing cooperatives. These cooperative institutions are operated strictly according to procedures outlined by the State. In some areas cooperatives seem to be organized to serve one commune and in other areas they are organized to serve the brigades and teams of several communes.[61] [62]

Cooperatives purchase goods on the local market which is controlled by the commune administration and they make contracts with brigades, teams, and households to supply products.[63] Supply and marketing cooperatives, also, are the main channels through which producer and consumer goods move to the ultimate consumer. Commune centers often have a cooperative retail store. Goods warehoused at commune levels are distributed to branch stores at brigade levels.

Communes also regulate the scope and functions of rural markets. First category-rationed goods are prohibited from entering the market. Second category goods, however, enter the market where supply and marketing cooperatives purchase locally produced eggs, fruit, and nuts, and farmers exchange goods produced on their private plots.

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[57] Audrey Donnithorne, *China's Economic System, op. cit.*, p. 60.

[58] "Seven Years' Growth of Chinese People's Communes," NCNA, in English, Peking, Sept. 25, 1965 : in SCMP, No. 3547, Sept. 25, 1965, pp. 18–19.

[59] "Chinese Peasants Make Scientific Experiments," NCNA, in English, Kwangchow, Oct. 11, 1974 : in SCMM, No. 5724, Nov. 1, 1974, pp. 130–133.

[60] Audrey Donnithorne, *China's Economic System, op. cit.*, Chap. 11.

[61] Chu Li and Tien Chieh-yun, *Inside a People's Commune: Report From Chi Li Ying,*

[62] "A Cooperative in Yenan Develops Revolutionary Traditions and Advance Along Chairman Mao's Revolutionary Line," KMJP, Peking Oct. 20, 1970 ; translated in SCMP, No. 4771, Nov. 3, 1970, pp. 54–62. Also see, "Outstanding Party Branch Secretary of Rural Supply and Marketing Co-op," NCNA, English, Sian, Mar. 10, 1971 ; in SCMP No. 4862, Mar. 22, 1971, pp. 23–24

[63] "An Example of Learning from Tachai by a High-yield Area South of the Yangtse River," JMJP, Peking, Dec. 31, 1970 ; translated by SCMP, No. 4830, February 3, 1971, pp. 88–91. Also see, "Capitalist Tendency in Sideline Production Must Be Criticized" JMJP, Jan. 26, 1970 ; translated in SCMP, No. 4597, Feb. 16, 1970, pp. 6–10.

Credit and banking services at the commune level are provided by branches of the People's Bank and by credit cooperatives. The county-level People's Bank controls the operations of its branch banks. These branch banks serve as the guardians of State interest in communes as the bank monitors the financial transactions of commune accounts held by the bank, and analyzes commune management, productive capacity, and financial records to determine the credit worthiness of the commune in responding to commune applications for production loans.

Credit cooperatives are not strictly state institutions as indeed they are cooperatives organized at the commune level by private citizens. They are managed by politically reliable poor and lower middle peasants. Former landlords and rich peasants are excluded from holding office. In practice credit cooperatives function under the guidance and direction of the People's Bank. In recent years reports from China indicate large numbers of rural households now have savings accounts.[64] Initially credit cooperatives were to function primarily to make consumer loans available to households temporarily short of cash.[65] However, since 1966, credit cooperatives have been called on to make production loans available to brigades and teams.[66] For example, a recent news report from China indicated that 12 percent of credit co-op loans were extended to farm families and 88 percent were granted to teams, brigades, and communes.[67]

In addition, most communes in the past 12 years have established a rural wired-broadcast network. The commune broadcast station receives programs via wireless from provincial radio stations. These programs, along with locally produced news, weather, music, and entertainment programs, are broadcast daily through wire lines running to loudspeakers at brigade and team centers and in the homes of most households.[68]

3. RELATIONSHIPS BETWEEN COMMUNE AND OTHER LEVELS

Commune leaders continue to look to county Government and Party leaders for guidance, target plans, and authority to approve certain actions. As was the case in 1963, communes today continue to have in-

[64] "Rural Collective Deposits and Savings of Commune Members Increase Markedly As a Result of Our Country's Ten Consecutive Years of Bumper Harvests, and Continuous Consolidation and Development of Collective Economy, and the Gradual Increase of the Income of Members," JMJP, Feb. 24, 1972 : translated in SCMP, No. 5087, Mar. 7, 1972, pp. 69–70.

[65] "A Positive Readjustment of Rural Credit Cooperatives Must Be Carried Out," TKP, Editorial, Oct. 23, 1963 : translated in SCMP, No. 3104, Nov. 20, 1963, pp. 4–6.

[66] "Pay Attention to the Countryside and Promote Development of Agricultural Production in a Big Way," *Chung-kuo chin-jung* (*China Finance*), Editorial, No. 2, Jan. 24, 1966; translated in SCMM, No. 675, Mar. 9, 1970, pp. 25–29.

[67] NCNA in Chinese Nov. 21, 1974.

[68] Elizabeth F. Crook and Frederick W. Crook, "Wired Broadcasting in the People's Republic of China," *Western Electric*, vol. XXV, No. 6, July–August, 1973, pp. 26–31.

stitutions located within their boundaries over which they do not exercise full control. Among these institutions are Government-controlled high schools, branches of the People's Bank, Supply and Marketing Co-ops, tax offices, grain depots, State purchasing stations, and machine tractor stations.[69] [70] [71] Commune cadres of course work very closely with officers in these institutions to coordinate policies and programs.

Regarding economic and commercial transactions, communes arrange contracts with State-owned factories to produce various items. For example the Hsu-hang commune made light bulbs on contract for a Shanghai factory,[72] and communes near Peking supply vegetables to the Peking Municipal Vegetable Corporation.[73] Communes also make contracts with State institutions to supply labor force units. For example, the State-owned Sha-tze-kang Tree Nursery Farm in Kiangsi Province employed workers from nearby communes to care for the seedlings.[74]

The second class of relationships are those between the commune and its subordinate units. Leaders in the various departments assist their counterparts at brigade and team levels to make and to carry out production plans. Communes send cadres to give ideological and technical training to backward brigades and teams.[75] Commune officers receive periodic reports from brigade and team officers and hold periodic meetings with them.[76]

The third class of relationships are those between individual communes. Communes cooperated with each other to reclaim land from the sea,[77] build hydroelectric power stations,[78] run fertilizer plants,[79] and construct irrigation systems.[80] Four communes in one case cooperated together to overcome a drought condition. Brigades in one commune were compensated by three other communes when the

[69] For example see "Commercial Workers Wholeheartedly Serve People in Mountainous Area of Sinkiang," NCNA, in English, Urumchi, Mar. 10, 1971, in SCMP, No. 4861, Mar. 19, 1971 pp. 185–186.

[70] Chu Li and Tien Chieh-yun *Inside a People's Commune: Report from Chi Li Ying,* Foreign Language Press, Peking, 1974, p. 101.

[71] Ian Davies, "The Chinese Communes—An Australian Student View," EH, vol. VII, No. 1, 1969, pp. 34–44.

[72] *The Western Producers,* Canada, Oct. 12, 1972.

[73] Lung Yeh, "Vegetables in Abundance for Peking," CR, vol. XII, No. 8, August 1963, pp. 2–5.

[74] Rewi Alley. *Travels in China, 1966–1971,* Peking, New World Press, 1971, p. 289.

[75] L. C. Schenk-Sandbergen, "How the Chinese People Remove Polarization within Their Countryside," EH, vol. XII, No. 3, 1973, p. 13.

[76] "Start a System of Keeping Records in People's Communes and Production Brigades, JMJP, Nov. 27, 1963; SCMP, No. 3122, Dec. 18, 1963, pp. 10–11. Also see *Nung-ts'un jen-min kung-she sheng-ch'an tui k'uai-chi (Accounting for Production Teams of Rural People's Communes)*, Compiled by the People's Bank of China, Kwangtung Province Branch Bank. Kwangtung jen-min ch'u-pan she, September 1974, p. 11.

[77] "East China People's Communes Transform Sea Bay into Inland Lake," NCNA, in English, Hangchow, July 14, 1974; No. 5661, July 25, 1974, p. 165.

[78] "Agricultural News in Brief," NCNA, in English, Peking, July 26, 1974: in SPRCP, No. 5669, Aug. 6, 1974, p. 50; also see "Communes Build Water Conservancy Works Hydroelectric Power Stations," NCNA, in English, Kunming, May 14, 1969; in SCMP, No. 4419, May 20, 1969, pp. 20–21.

[79] "Firmly Uphold Chairman Mao's Revolutionary Line, Make All-Round Development," Peking, JMJP, Mar. 12, 1971, in SCMP, No. 4865, Mar. 25, 1971, pp. 151–153.

[80] *The Western Producers,* Oct. 12, 1972.

brigades' crops were sacrificed as ditches were dug across brigade land to bring water to save the parched crops in the many other brigades in the other communes.[81]

Communes obtain their income from the sale of products made by commune-owned shops and factories to State institutions and to other communes, to its own brigades and teams, and to commune members. Commune-owned tractors, operators, and machines are rented out to brigades and teams. Commune-owned hydroelectric plants sell electricity to brigades, teams, and households. Some communes also own some farmland and timberland which is rented to brigades and teams. Communes also charge for services they perform such as the use of veterinary stations, repair of agricultural machinery, and the transportation of goods. Income from these enterprises is used to defray operating costs, wages, purchase of materials, and taxes.

[81] Ying Hua, "For the Greater Good," CR, vol. XII, No. 11, November 1963, pp. 16–18.

TABLE II.—SELECTED PROVINCIAL DATA ON NUMBER OF UNITS IN COMMUNE SYSTEM, 1963–74

Geographic unit	Year	Number of communes			Number of brigades			Number of teams		
		Province	Region	County	Province	Region	County	Province	Region	Count
Chekiang [1]	1974	2,800								
Heilungkiang: Wang-k'uei County [2]	1968			17			167			1,248
Hopeh [3]	1973				53,086					
Peking municipality [4]	1966	260								
Hunan [5]	1970	3,200			45,000					
Hupeh [6]	1973	4,300			31,000					
Kansu [7]	1974	1,300			14,000					
Yu-men County [8]	1973			8			61			351
Kiangsi: I-ch un region [9]	1963		671			3,870			37,306	
Kiangsu: Soochow region [10]	1964		200							
Shanghai municipality [11]	1973	197			2,760			8,000		
Kirin: Huai-te County [12]	1972			33			375			3,126
Kwangsi: Liu-chou region [13]	1973		128							
Kwangtung [14]	1963	1,600			20,000			440,000		
Lu-ting County [15]	1972			22			303			4,700
Liaoning [16]	1963	1,141								
Shansi:										
Chin-tung-nan region [17]	1972		348			5,617				
Chin-chung region [18]	1973		226							
Shensi: Sian municipality [19]	1973		86			1,426			6,424	
Sinkiang [20]	1966	500								

Szechwan [21]	1963	7,000					
([22])	1973	8,200		73,000		497,000	
Yunnan [23]	1973	1,236				135,947	
Chao-tung County [24]			15		141		1,658

[1] "Collectivization Brings Prosperity to Rural Areas in Chekiang Province," NCNA, Hangchow, Oct. 1, 1974; in SPRGP, No. 5717, Oct. 17, 1974, pp. 176–178.

[2] The Revolutionary Committee of the Wang K'uei hsien Agricultural Machine Station, Heilungkiang Province, "Smash Foreign Conventions, Overhaul Engines with Mao Tse-tung's Thought in Command," Nung-yeh chi-hsieh chi-shu (Agricultural Techniques), No. 9, 1968; translated in SCMM, No. 632, Oct. 28, 1968, pp. 28–38.

[3] See NCNA, English, Aug. 30, 1973; published in "Summary of World Broadcasts," Sept. 19, 1973.

[4] "Rural People's Communes Around Peking Transform Agriculture," New China News Agency, English, Peking, Feb. 6, 1969; in SCMP, No. 3635, Feb. 10, 1966, pp. 20–21.

[5] Rewi Alley, "Travels in China, 1966–71," Peking, New World Press, 1973, p. 48.

[6] "Learning from Tachai Boosts Agriculture in Hupeh," Wuhan, Hupeh Provincial Service in Mandarin, Aug. 26, 1973; translated in FBIS, "Daily Report: People's Republic of China," No. 165, Aug. 29, 1973, pp. 1–2.

[7] Rewi Alley, "North-west Return," EH, vol. 8, No. 2, pp. 12–13.

[8] Rewi Alley, "Through the Kansu Panhandle and Down the Old Silk Road," EH, vol. XII, No. 6, 1973, p. 21.

[9] "Kiangs Broadcasting Station," June 12, 1963; in "Rural Organization," CNA, No. 539, Nov. 6 1963, p. 2.

[10] "Communes on Yangtse River Delta Launch Emulation Campaign," New China News Agency, English, Nanking, May 13, 1964; in SCMP, No. 3221, May 19, 1964, pp. 9–10.

[11] L. C. Schenk-Sandbergen, "How the Chinese People Remove Polarity within their Countryside," EH, vol. XII, No. 3, 1973, p. 11.

[12] "Kirin County Improves Broadcasting Network," Changchun Kirin Provincial Service, Sept. 16, 1972; FBIS, No. 182, Sept. 18, 1972, pp. G–1 and 2.

[13] "Kwangsi Support for Agriculture," Nanning, Kwangsi Chuang Regional Service in Cantonese, Jan. 23, 1973; translated in FBLS, "Daily Report: People's Republic of China," No. 22, Feb. 1, 1973 p. D–8.

[14] "Promote the Spirit of Hard and Practical Work Shown on Hailing Island—Comrad T'ao Chu Visits Hailing and Talks about the Trip," NFJP Apr. 21, 1963; pp. 3–10; "Kwangtung Cooperative Medical System," Canton, Kwuantung Provincial Service in Mandarin, Feb. 27, 1973; in FBIS, "Daily Report: People's Republic of China," No. 41, Mar. 1, 1973, p. D–7.

[15] Rewi Alley, "Loting Where the Impossible Has Been Achieved," EH, vol. XI, No. 3, 1962, p. 27.

[16] NCNA, Sept. 12, 1963, p. 12, p. 3, in Chinese.

[17] Rewi Alley, "New Life of a 3,000-year-old City and Its Surroundings," EH, vol. XII, No. 3, 1973, p. 20.

[18] "Shansi Regional Roads," TaiyÜan, Shansi Provincial Service in Mandarin, Feb. 9, 1973; translated in FBIS, "Daily Report: People's Republic of China," No. 33, Feb. 16, 1973, p. F–1.

[19] L. C. Schenk-Sandbergen, op. cit., pp. 15–16.

[20] "Uighur People's Victorious March Along Path Pointed Out by Chairman Mao," New China News Agency, English, Urumchi, Aug. 28, 1965; in SCMP, No. 3772, Sept. 1, 1972, pp. 25–27.

[22] "Ch'uan kuo ke ch'eng shih chi hui yu-hsing huan-tu kuo ch'ing" ("National Day Celebrations Enthusiastically Held in Cities Throughout China"), JMJP, Oct. 5, 1963, p. 2.

[22] Rewi Alley, "Among the Tibetans and Chiang," EH, vol. XII, No. 5, 1973, pp. 17–18; JMJP, Oct. 5, 1963, p. 2 said there were 7,000 RPC's.

[23] "Yunnan Public Health," Kunming, Yunnan Provincial Service in Mandarin, Feb. 1, 1973; translated in FBIS, "Daily Report: People's Republic of China," No. 23, Feb. 2, 1973, p. E–2. For numbers of teams, see Yunnan Provincial Broadcast, Mar. 4, 1975.

[24] "Broadcasting in a YÜnnan County," Kunming, Yunnan Provincial Service in Mandarin, Sept. 17 1974.

B. Brigade Level

Production brigades have a much more important role in the commune system today than they did in 1963. When communes were restructured in 1961–62 and production teams were made the basic unit of ownership and account, some brigade cadres voiced the opinion that their unit had become a transportation and communication center and they, in turn, had become mere propagandists and collectors of grain and taxes.[82] [83]

Since 1963, however, the Party and Government have looked to the brigade with its Party Branch and militia unit to manage and control the political, social, and economic life in rural areas. In general, the brigade is the lowest level at which Party institutions are organized. At the beginning of the period, brigades had to rely more on normative and coercive controls to manage rural life.[84] However, with the development of social services at the brigade level and with the growth in rural industry, the brigade now has resources at its disposal which semi-autonomous production teams cannot now afford to ignore.

1. SIZE AND ORGANIZATION

Production brigades are estimated to number about 750,000. On the average, a brigade has approximately 7 production teams, about 220 households and roughly 980 persons. On the average, a brigade cultivates about 136 hectares (336 acres).[85] At the brigade level, one finds the brigade congress, the management committee (revolutionary committee), the Party branch, the political "evening school," the militia company or battalion, primary schools, a medical station and brigade-run industries.

While most brigades have production teams, some communes have made the brigade the basic unit of ownership and account. This action was laudable by ideological standards in that it represented one step nearer the goal of eventual elimination of collective ownership and the establishment of socialist ownership or ownership by all the people. Only in advanced units, where ideological and economic conditions permitted and where the masses "willed it," were brigades permitted to become the basic unit of account and ownership. Tachai, the famous model unit from Shansi Province, is a brigade which has no teams and is a basic unit. Nonetheless, as far as could be determined from the reports on communes examined for this study, nearly all brigades have teams and are not basic units. Indeed Article 7 of the new constitution states that generally brigades are not to be made the basic accounting unit.[86]

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[82] Wang Kuan-hsiang, "Are Production Brigades Cadres Mere 'Propagandists' and 'Collectors'? Have Production Brigades Become 'Transportation Stations'?" NFJP, Apr. 8, 1962; translated in SCMP, No. 2733, May 8, 1962, pp. 16–17.

[83] Liang Huan-shu, Secretary of the Party Branch of Ts'ao p'u Brigade, "Cadres of Brigades Are Not Without Anything To Do," NFJP, Apr. 4, 1962; translated in SCMP, No. 2771, July 5, 1962, pp. 13–14.

[84] Robert J. Birrell, "The Centralized Control of the Communes in the Post 'Great Leap' period," in A. Doak Barnett (ed.). *Chinese Communist Politics in Action,* Seattle, Wash., University of Washington Press, 1969, pp. 400–443.

[85] See Appendix II regarding estimates of brigade size.

[86] "Constitution of People's Republic of China," NCNA, in English, Peking Jan. 19, 1975; in *Current Background,* No. 1024, Jan. 31, 1975, pp. 14–25, Article 7.

Only a few brigades were found which had no production teams. At the other extreme one brigade in Anhwei Province had 33 teams.[87] [88] A brigade in Shansi Province reported the largest number of households at 1,120,[89] and a brigade in a small mountain village in Hopeh Province reported the smallest number of households at 20.[90] A brigade in Heilungkiang reported the largest amount of arable land at 1,460 hectares (3,608 acres) [91] while the smallest amount of arable land reported came from a brigade in Chekiang Province with 43 households and only 9.3 hectares (23 acres).[92]

Data presented below illustrates the wide variation in the average number of brigades and teams per commune. Using data from table 2, the average number of teams per brigade in the selected geographical regions would be as follows: [93]

Heilungkiang, Wang Kuei County	7.5
Kiangsi, I Ch'un Region	9.6
Kwangtung	22.0
Lu Ting County	15.5
Shensi, Sian	4.5
Szechwan	6.8

Differences in the size of brigades between rural and suburban areas generally correspond to differences in commune size discussed previously. Data for the same set of provinces was aggregated as follows:

	Number of persons		Number of households		Hectares of arable land	
	Rural	Suburban	Rural	Suburban	Rural	Suburban
Hopeh	[17] 992	[21] 3,043	[19] 221	[13] 351	[16] 145	[17] 382
Shansi	[18] 1,303	[3] 2,014	[17] 226	[4] 447	[14] 312	[1] 563
Kwangtung	[4] 3,377	[13] 2,858	[2] 905	[11] 642	[6] 148	[9] 226

With the exception of Kwangtung, suburban brigades are larger than those in rural areas.

Whereas there seems to be a distinct pattern with regard to size of communes in which communes were found to be larger in Kwangtung, followed by Hopeh and Shansi, brigade size did not follow the same pattern. Kwangtung brigades in terms of population and households were larger than Shansi brigades, but Shansi brigades in terms of arable land were larger than brigades in Kwangtung and Hopeh.

Arable land per person for rural and suburban brigades in the three provinces is calculated as follows:

	Hectares per person in rural brigades	Hectares per person in suburban brigades
Hopeh	0.146	0.126
Shansi	.239	.280
Kwangtung	.044	.079

[87] [88] "Tachai North Huai River," NCNA, in English, Hofei, Sept. 15, 1969; *SCMP*, No. 4500, Sept. 22, 1969, pp. 19–22.

[89] Rewi Alley, *Travels in China, 1966–1971*, Peking, New World Press, 1973, pp. 542–543.

[90] "A Good Teacher in a Mountain Valley," NCNA, Aug. 16, 1969; in SCMP, No. 4481, Aug. 22, 1969, pp. 20–21.

[91] "T'ai-p'ing Brigade Relies on Collective Strength for Agricultural Mechanization, JMJP. Aug. 26, 1971; translated in SCMP. No. 4971, Sept. 9, 1971. pp. 136–141.

[92] Chao Ta-hsi, "Tsai she-hui chu-i ta-tao shang—hsin-fu-te Yü-chuang" ("Prosperous Yü-chuang—on the Broad Socialist Road"), MTTC. No. 2, February 1966, p. 2.

[93] Data in this table was taken from table II, pp. 386–387.

As might be expected, farmers in Kwangtung Province require less arable land because of a longer growing season and more ample rainfall than farmers in northern provinces.

2. FUNCTIONS AND ACTIVITIES AT BRIGADE LEVEL

a. Administration

Brigades are structured today much the same as they were in 1958 (see the organization chart on page 370. Members in brigade congresses continue as before to elect a preselected slate of officers for chairman and members of the management committee or revolutionary committee as the case may be.

While not all brigades have Party branches,[94] a survey of reports since the beginning of the Cultural Revolution suggests that the great majority now have them. Party membership has grown in this period and Party organizations have been strengthened since the period began.[95] The Party branch secretary continues to be the most important leader at the brigade level. Party branch leaders today hold concurrent positions in brigade management (revolutionary) committees as was the case at the beginning of the period.[96]

Another index of the brigade's increasing importance is the fact that in the past few years more brigades have obtained headquarters buildings. These buildings house offices for members of the brigade's management committee and Party branch. They also provide space for the credit cooperative, the branch store of the supply and marketing cooperative, and various brigade industries. These headquarters, usually located in the largest village within the boundaries of the brigade, seem to have become an increasingly important center of rural life.[97] [98]

Depending upon size, a production brigade may have a militia company or a battalion.[99] [100] After the head of the militia unit is also the chief of the security section of the brigade's management committee. This fact highlights once again the concurrent holding of jobs in different organizational systems and stresses the fact that one of the militia's most important functions is public security.[101] Militia units have important economic functions as well, such as fighting forest fires and reclaiming land.[102]

Moreover, militia units have the special function of mobilizing the masses to work on corvee labor-type projects. They seem to be the activists who go to the worksites illustrating to their fellow brigade members that the work can and will be done. Furthermore, they are called on to do difficult and sometimes dangerous tasks on construction

[94] "Go to the Production Team and Do Its Work Well!" SSSI, No. 8, Apr. 16, 1964; translated in SCMM. No. 418, May 25, 1964, pp. 47–48.

[95] "Kwangtung CCP, Committees Decision on Agriculture Reported," FBIS, *Daily Report: People's Republic of China*, No. 26, Feb. 7, 1973, p. 1–7.

[96] Prof. A. Doak Barnett, *Cadres, op. cit.*, p. 361. Also see "Poor Mountain Village in South China Transformed by Mao Tse-tung Thought," NCNA, in English, Nanning, Feb. 4, 1970; in SCMP. No. 4596, Feb. 13, 1970, pp. 126–128.

[97] Rewi Alley, "In Two Counties of Taihang Shan," EH, vol. XII, No. 2, pp. 15–32. (1973).

[98] Rewi Alley, *Travels in China, 1966–1971*, Peking, New World Press, 1973, pp. 336–337. No. 5, 1974, pp. 27–38.

[99] Rewi Alley, *Travels in China, 1966–1971*, Peking, New World Press, 1973, pp. 336–337.

[100] "People's Daily on Correct Way to Diversity Production," Peking, JMJP, in Chinese, June 21, 1973, p. 2; translated in FBIS, *Daily Report: People's Republic of China*, No. 135, vol. I, July 13, 1973, p. B–1.

[101] Rewi Alley, *Travels in China, 1966–1971*, Peking, New World Press, 1973, pp. 135–139.

[102] "Heroic Militiamen Put Out Forest Fires," NCNA, in English Wuhan, May 12, 1968; in SCMP, No. 4180, May 17, 1968, pp. 18–20.

work. For example, the commander of a brigade militia unit in Hunan Province led a group of workers to drill holes and set off explosive charges to construct an irrigation ditch alongside a steep cliff.[103] Brigades function today much as they did in 1963.[104] They serve as an intermediary collecting reports from teams and sending them to the commune, and, in turn, passing instructions and policies from the commune to the teams. The brigade receives state plan targets, compulsory state procurement (grain) quotas, and schedules for delivering grain taxes and then works out plans with its teams to achieve these targets. Brigades continue to mobilize the rural labor force to build roads, canals, and water conservation projects. Brigades, of course, continue to manage their own enterprises and cooperate with teams to manage joint enterprises. Since the Cultural Revolution, brigades have shouldered the burdens of managing rural health services and primary schools, and have some responsibility for supervising state-managed supply and marketing branch stores.

b. Production

Like the commune level, brigades do not produce a significant portion of basic agricultural commodities because teams manage most of the labor and arable land. Brigades, however, do undertake certain agricultural production functions. They often engage in swine production, i.e., raising boars and brood sows to produce piglets which are sold to teams and households.[105] [106]

Brigades also operate orchards,[107] fish ponds, and fishing boats,[108] and manage timberland. For example, one brigade in a mountainous region in Anhwei Province afforested 1,300 hectares (3,212 acres), operated a tree nursery and supervised a timber mill.[109]

Although statistical information is not currently available to indicate trends, many reports on the commune system give the strong impression that the past 12 years have seen considerable growth in brigade-level industry. This industry generally is of a smaller scale, requiring less capital, labor inputs, and technical skills than those run by the commune.

The most frequently mentioned brigade level industries were grain, fiber, edible oil processing, and farm equipment repair shops. Specialized regional industries frequently mentioned in the reports include mining, tea curing, and crushing of sugar cane. Industries not as widespread as the first category, but still rather common include: Food processing plants producing bean curd and noodles; kilns manufacturing bricks, tiles, and lime; and shops weaving native materials to make gunny sacks, straw mats, hemp rope, and wicker baskets. Among

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[103] "Advancing in Spirit of Tachai, Model in China's Agriculture," NCNA in English, Jan. 15, 1970; in SCMP, No. 4581, Jan. 21, 1970, pp. 67–69.

[104] Prof. A. Doak Barnett, *Cadres, op. cit.*, pp. 372–373.

[105] "Two Good Short Investigative Reports," HC, No. 8, 1972, pp. 43–49; translated in SCMP, No. 5188, Aug. 3, 1972, pp. 155–158.

[106] "Prosperous Northwest China Commune," NCNA in English, Sian Apr. 10, 1974; in SCMP, No. 5598, Apr. 22, 1974, pp. 22–23.

[107] "Kirin People's Commune Benefits From Mechanization," Peking, NCNA in English, Sept. 21, 1973; in FBIS, *Daily Report: People's Republic of China*, No. 188, Sept. 27, 1973, pp. G–5 and 6.

[108] "Chekiang Fishing Industry Mechanizes Operations," Peking NCNA, July 4, 1972; FBIS, *Daily Report: People's Republic of China*, No. 132, July 7, 1972, p. C–2.

[109] "Anhwei Commune Overcomes Hardships by Diversifying Economy," Peking, NCNA in English, Oct. 16, 1973; in FBIS, *Daily Report: People's Republic of China*, No. 202, Oct. 18, 1973, pp. C–3 and 4.

the more unusual industries reported at the brigade level were weaving and knitting cloth, manufacturing paper, generating hydroelectric power, and operating an inn.

c. Services

Service activities provided by brigades have expanded greatly since 1963. Some improvements occurred in brigade level health and education service from 1963–65. During and after the Cultural Revolution, however, great efforts were made to improve these services.

Most brigades in China now have health stations staffed by part-time health workers. Brigade health workers receive training from commune clinics, from special training courses at the county level, and from People's Liberation Army medical teams.[110] Health workers earn part of their living by earning work points laboring in agriculture.[111] For their health services, the brigade gives them a subsidy to bring their income level up to the average earnings in the brigade.[112] These paramedics render simple treatment to farmers, refer more serious cases to commune clinics, work on public health problems, and teach health classes in primary schools.[113] Both Western and traditional Chinese treatments and medicines are used in treating patients.[114]

About half of the brigades in the country now have cooperative medical systems.[115] [116] Persons in the brigade can become cooperative members of the system by paying a small fee (1 yuan per year). For every person who subscribes, the brigade makes a small contribution (0.10 yuan) which it draws from its welfare fund. Patients pay a small fee (0.5 yuan) per visit to the health stations.[117] However, difficulties in recruiting and training personnel, and finding adequate funds, are problems which are yet to be resolved.

Brigades continue to be responsible for running primary schools.[118] As before, the brigade's Party branch committee person for propaganda continues to be responsible for managing the schools. The achievements of China's rural education efforts prior to the Cultural Revolution have been chronicled elsewhere.[119] [120] As far as could be judged from the research materials gathered for this report, the system seems to have continued to improve in the past 6 or 7 years.

During the Cultural Revolution, and especially since 1968, poor and lower middle peasants in brigades have been mobilized to manage primary schools.[121] If there is a limited number of spaces in school, then

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[110] Rewi Alley, *Travels in China, op. cit.*, pp. 164–165.

[111] One labor day equals ten work points. See pages 400 ff. for more details regarding the meaning of labor days and work points.

[112] Paul G. Pickowicz, "Barefoot Doctors in China: People, Politics, and Paramedicine," EH, vol. XI, No. 5, 1972, p. 32.

[113] Rewi Alley, *Travels in China, op. cit.*, pp. 164–165.

[114] "Co-op Medical Care in Sun Village," CR, vol. XXI, No. 11, November 1972, pp. 2–7.

[115] "Health and Medical Care for the People," CR, vol. XX, No. 6, June 1971, pp. 2–3; also, "Co-op Medical Care in Sun Village," CR, vol. XXI, No. 11, November 1972, pp. 2–7.

[116] David M. Lampton, *op. cit.*, p. 4.

[117] "Shen shou p'ing hsia chung nung huan ying te ho-tso i-liao chih-tu," (The Cooperative Medical System Is Being Deeply Appreciated by the Poor and Lower Middle"); JMJP, Dec. 5, 1968, p. 1.

[118] See Prof. A. Doak Barnett, *Cadres, op. cit.*, pp. 386–388.

[119] The Editor, "Educational Reform and Rural Resettlement in Communist China," CS, vol. VIII, No. 17, November 1970, pp. 1–8.

[120] The Editor, "Recent Developments in Chinese Education," CS, vol. X, No. 7, July 1972, pp. 1–6.

[121] For example, see "The Question of Prime Importance in the Revolution of Education in the Countryside Is That the Poor Lower-Middle Peasants Control the Power in Education," JMJP, Peking, Oct. 18, 1968; translated in Current Background, No. 868, Dec. 31, 1968, pp. 1–5.

poor and lower middle peasants presumably decide whose children will attend. The move to make poor and lower middle peasants responsible for primary schools could also be an attempt by government to make the system more responsive to rural needs. At present, the primary emphasis of education is to train workers who will increase rural production, not migrate to the cities, as has occurred so frequently in developing economies. In fact, educated youths from urban areas are being used as teachers in these primary schools. Other teachers include the head of the militia unit, brigade accountants, paramedics, and agricultural technicians. These teachers, far from being elevated beyond the rural population, are now being paid in work points and receive only the average local income of the farmers they serve.

Brigade-run schools charge tuition fees as brigade incomes generally cannot fully support operation of the schools. Some brigades give land for students and teachers to work to help support the school and others encourage classes to engage in subsidiary production activity to help support their education.[122]

Regarding marketing services, supply and marketing cooperatives often have branches at the brigade level. These branches receive direction from the headquarters of the supply and marketing cooperative, and from the brigade management committee and Party Branch. Especially since the Cultural Revolution, local inhabitants have increased their voice in managing these branches. These branch stores stock small quantites of producer goods and function to supply farmers with manufactured daily necessities of life, such as needles, thread, and rubber shoes. The stores also purchase category 2 goods, pigs, fruit, and handicraft items for the State from brigades, teams, and households.

Branches of credit cooperatives are located at brigade centers. Households put their excess funds in savings accounts in these branches, and can obtain consumption loans from the cooperative, if sanctioned by the proper authorities. From the evidence currently available it was not possible to determine if brigades and teams had their financial accounts with branch credit cooperatives or with branches of the People's Bank at the commune level.

3. CONNECTIONS

While commune level connections with institutions outside the commune system were expected, similar relations between brigades and outside institutions were not expected, but nonetheless may not indicate a degree of autonomy as they may have been required to obtain approval from the commune level before engaging in the kinds of activities explained below. For example a brigade in Hopeh Province processed hog bristles for the Shihchiachuang Animal Products Co.[123] A State farm in Kwangtung Province paid cash to a brigade which mobilized its labor force to construct fields for the farm.[124] A brigade near Chengtu agreed to supply labor force units for use by a transport

[122] See Rewi Alley, *Travels in China, 1966–1971*, op. cit., pp. 268–269.
[123] Chang Ho-wei, "The Worker-Peasant Labor System in Finance and Trade Departments," HCS, No. 1–2, Feb. 20, 1966; SCMM, No. 534, July 25, 1966, p. 33.
[124] "T'ieh-chien sung ch'iung-shih, ch'ih-shou huan hsin-t'ien" ("Iron Shoulders and Bare Hands Eliminate the History of Poverty and Construct a New World"), NFJP, January 2, 1966, p. 2.

and storage company.[125] A brigade near Peking signed a contract to supply vegetables to a specific marketplace.[126] Foreign trade departments approached brigades in Hopeh to process goods for export.[127] [128]

The connections between brigade and team are of great importance because the brigade is the last link in the chain of institutions which bind the Party and Government to the basic production unit in rural China. The best plans and policies from Peking tend to miscarry if there is poor exchange between brigade and teams. We know that State plans, policies, procurement targets, and tax quotas are passed from brigades to teams. We do not know precisely how this is accomplished, nor how brigades motivate or lead teams to implement policies and meet targets. Much to the chagrin of researchers, there seems to be an inverse relationship between the importance of these subjects and the quantity of research material available.

Moreover, of the small amount of information obtained, more of it concerned how brigades ought not to work with teams than how they actually did work with teams. Brigades selected for criticism usually violated the rights of teams. For example, one brigade in Liaoning mobilized the labor force of all teams to construct a reservoir regardless of whether teams would benefit from the project or not. Members of those teams not benefited by the reservoir lagged behind in their work on the project. They began to work diligently only when the brigade following the principle of exchange at equal value and began to compensate the laborers for their work.[129]

Regarding the interconnections between individual brigade-level units, the famous Sha Shih Yu (Sand Stone Gulch) Brigade in Hopeh Province provides a good example of cooperative activity. A neighboring brigade gave its consent for Sand Stone Gulch Brigade to drill an irrigation well in one of its fields.[130] Less neighborly feelings were generated in two brigades also in Hopeh Province when children of one brigade killed an animal belonging to a second brigade. The brigades were not on speaking terms until amends were made and the animals lost were replaced.[131] Commercial transactions also occurred between brigades in which hatching eggs and draft animals were exchanged for cash.[132] [133]

C. Team Level

In the past 12 years, the production team has lost some of its importance because of the growth of industry and services at the commune and brigade level. Nevertheless, aside from the family, the

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[125] "Szechwan Factories and Mining Enterprises Extensively Experiment on Labour System of Work and Farming by Rotation," NCNA, in English, Chengtu, December 27, 1965; SCMP, No. 3615, Jan. 12, 1966, pp. 18–20.

[126] "Advanced Vegetable Production Brigade on Peking Outskirts," NCNA, in English, Peking, July 2, 1971; SCMP, No. 4935, July 13, 1971, pp. 88–89.

[127] "Organize Peasants to Process Export Products on the Spot," TKP, Peking, Aug. 31, 1965; SCMP, No. 3542, Sept. 22, 1965, pp. 11–13.

[128] "T'ieh-chien sung ch-iung-shih, ch'ih-shou huan hsin t'ien" (Iron Shoulders and Bare Hands Eliminate the History of Poverty and Construct a New World"), NFJP, Jan. 2, 1966, p. 2.

[129] "Liaoning's Fu County Corrects Errant Rural Policies," NCNA, Peking, Domestic Service in Chinese, Jan. 4, 1973; FBIS, *Daily Report: People's Republic of China*, No. 11, vol. 1, Jan. 16, 1973, G–1.

[130] "North China Rural Cadre Reviews Changes in His Village," NCNA, in English-Shihchiachuang, Jan. 12, 1974; SCMP, No. 5539, Jan. 22, 1974, pp. 45–49.

[131] Rewi Alley, *Travels in China, 1966–1971*, New World Press Peking, 1973, p. 144.

[132] "Rely on Poor and Lower-Middle Peasant for Successful Financial Management," Peking, JMJP, Oct. 21, 1971; SCMP, No. 5009, Nov. 8, 1971, pp. 10–16.

[133] Liu I-yung, "Make Efforts To Study Amid the Storm of Class Struggle," HC, No. 11, Oct. 1, 1971; SCMM, No. 715, Nov. 1, 1971, pp. 13–19.

production team today is still, by far, the most important institution in rural China.

The team is the organization in which families first come in contact with an institution organized by the Party and Government. It is the institution which controls most of the means of production in China's countryside. It is the unit which takes final responsibility for most of the economic decisions made in rural areas. It is in the context of the teams that individuals are mobilized to work in the fields. Motivation originates in these organizations which calculate profit or loss and which distribute income to members, the collective, and the state. Most of the grain and foodstuffs in China are raised and consumed within the confines of this unit. No other institution in China so deeply affects every major aspect of the lives of China's rural population.

Unfortunately source materials collected generally yielded much less information about this important unit than regarding communes and brigades. Chinese authors seem much more willing to discuss the latter than they do to describe the organization, activities and functioning of teams.

1. SIZE AND ORGANIZATION

Production teams are estimated to number about 5 million. On the average a team has about 33 households, approximately 145 persons and cultivates roughly 20 hectares (49 acres). (See Appendix II regarding estimates of team size.) Because of the lack of data on teams, it is not possible to highlight differences in team size from province to province, and differences between rural and suburban teams. Some teams were as large as the average brigade, for example, one team in Hopeh had 196 households, 985 persons.[134] On the other hand, some teams had as few as 11 households and 50 persons[135] and some specialized teams had almost no arable land at all.[136] For instance, one team near Shanghai had only 1.9 hectares (4.7 acres).[137]

2. FUNCTIONS AND ACTIVITIES AT TEAM LEVEL

a. Administration

In the past 12 years production team organization has not changed significantly (see the organization chart on page 370). As before, team members periodically elect an approved slate of officers, a team and a deputy team leader, and a management committee. In addition to the above officers, teams have an accountant or a work point recorder, a militia platoon leader, a sparetime wired broadcast repairman, and a custodian to care for the team's tools, animals, and granary.[138]

With the evidence currently available, it is difficult to measure the strength of Party organization and influence at the team level. Reports

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[134] Rewi Alley, *Travels in China, 1966–1971,* Peking. New World Press, 1973, pp. 157–158. 157–158.

[135] "Eleven Poor and Lower-Middle Peasant Households Build Socialist New Village Trough Diligence," NCNA, in English, Nanchang, Mar. 19, 1970; SCMP, No. 4624, Mar. 26, 1970, pp. 98–101.

[136] "Diversified Economy Can Be Developed Both in the Mountains and on the Plain," SSST, No. 15, Aug. 1, 1965: in SCMM, No. 497, Nov. 8, 1965, pp. 39–41.

[137] Revolutionary Committee, Hung Ch'iao People's Commune, Shanghai Hsien, "Advance Victoriously Along the Path Indicated by Chairman Mao," WHP, Aug. 29, 1968; translated in SCMP, No. 4263, Sept. 23, 1968, pp. 7–12.

[138] "In the Communes—Ownership on Three Levels," CR, vol. XXII, No. 1, January 1974, pp. 35–38.

were found indicating some teams in communes did not have any Party Members or organized Party cells.[139] For example Chia-ting County, in formulating a 6-year agricultural development plan, stipulated in article 29 that "Party groups (cells) should be set up in most of the production teams." [140]

The fact that cells were to be organized is evidence that, in 1974, most teams in this suburban Shanghai county did not have cells. Assuming half of China's 28 million Party members live at the basic level, and there are 10 members per commune and 8 members per brigade, there then would be slightly more than one Party member per team.[141] Some Party members holding positions at commune and brigade levels live at the team level lending Party influence to this level. Generally speaking, however, most teams appear not to have organized Party cells. If a team has a Party member, he usually concurrently has an important position such as team or deputy team leader, a phenomenon parallel to that found at brigade and commune levels.

b. Production and services

Most of the income generated in production teams comes from growing crops: Grain, cotton, oilseeds, fruit, vegetables, and other crops. Some income also comes from raising livestock, especially hogs, and catching fish. From materials collected from this report, it appears that production teams on the average had much less subsidiary production activity than brigades or commune levels. Individual teams reported activities such as earning money through transportation of goods,[142] making straw sandals [143] and mats,[144] fodder cutting,[145] and beekeeping.[146]

3. CONNECTIONS

As was the case with brigades, team connections with institutions outside the commune system may not indicate team autonomy because teams may have cleared activities with brigade and commune levels. Examples of these activities include the making of a contract between a team and an agricultural institute in which team laborers did some of the work on the experimental farm.[147] A team in Hopeh Province hired tractors from the county level tractor station to plow its fields.[148]

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[139] "Enthusiastically Cultivate Comrades Who Want To Be Admitted to the Party," JMJP, Aug. 30, 1972, p. 2; excerpts translated in FBIS, *Daily Report: People's Republic of China*, No. 184 Sept. 20, 1972, pp. B-1 and 2.

[140] "The 1974–1980 Agricultural Development Program of Chia-ting Hsien (Revised Draft), HHVPP, No. 9, Sept. 20, 1974, translated in SPRCM, No. 794, Oct. 13, 1974, pp. 19–29.

[141] "Press Communique of the Tenth National Congress of the Communist Party of China," in *The Tenth National Congress of the Communist Party of China (Documents)*, Peking, Foreign Languages Press, 1973, pp .77–85.

[142] "Szechwan Factories and Mining Enterprises Extensively Experiment on Labour System of Work and Farming by Rotation, NCNA, in English, Chengtu, Dec. 27, 1965; SCMP, No. 3615, Jan. 12, 1966, pp. 18–20.

[143] Rewi Alley, *Travels in China, 1966–1971*, Peking, New World Press, 1973, pp. 475–478.

[144] Shahid Javed Burki, *A Study of Chinese Communes*, Cambridge, Mass., Harvard University Press, 1969, pp. 1–101.

[145] "New Commune Members on Maochiashan Hill," CR, vol. 23, No. 10, October 1974, pp. 32–39.

[146] "Production Team Transforms Mountain Area in East China," NCNA, in English, Nanchang, Feb. 28, 1969; in SCMP, No. 4370, Mar. 6, 1969, pp. 13–14.

[147] "Mei Hsien Agricultural Institute Employs Contract Workers," NCNA, Canton, Nov. 22, 1965; translated in SCMP, No. 3596, Dec. 13, 1965, pp. 14–15.

[148] Elsie Fairfax-Cholmeley, "Two Weeks in a Commune," EH, vol. VII, No. 1, January–February 1968, pp. 35–39.

Teams in Liaoning Province worked with foreign trade departments to select, grade, pack, and deliver apples for export.[149] A team in Kiangsu Province made an agreement with a supply and marketing co-op in a different county to make raincoats.[150]

Regarding the connections between teams, some teams cooperated together to manage joint enterprises. In these enterprises teams invested resources, supplied the labor force, and shared costs and benefits in proportion to their level of ownership. References to these enterprises occurred more frequently in the mid-1960's than in recent years.[151] Of course, teams competing for scarce resources produced tensions. For example several teams in Kiangsu Province shared a rice threshing machine. When one team failed to cooperate properly in its use, the team was criticized at a brigade level meeting in which all the teams were present.[152]

The most important connections team leaders had to worry about were those related to income distribution in which the team had the responsibility to allocate income to the state, the collective (team), and to households. Income distribution and motivation of individuals is greatly affected by the structure of the commune system. Teams are small-sized collective farms in which farmers pool their lands, labor, and capital for purposes of production and agree to be remunerated by dividing the profits (the residual income left after payment of expenses and taxes) among themselves. Because the collective owns the means of production instead of the State the team is not strictly a socialist institution.[153]

Collective ownership requires that farm families themselves assume responsibility for production risks. In theory expenses and deductions could be equal to production leaving no residual income to be distributed to farmers. Moreover because teams are not state-owned, state labor regulations do not apply, and team members do not have guaranteed wages and related fringe benefits as do state farm employees and factory workers. Furthermore, because of labor discipline in the commune system, members are not allowed the freedom of independent farmers. Obviously, motivation is important in the system in which farmers are required to assume responsibility for risk taking, have no guaranteed wage, and do not have the freedom of individual proprietors.

Team members are motivated to work through a combination of material and nonmaterial incentives. Nonmaterial incentives include labor discipline codes, selecting and honoring "model" farmers for outstanding work, and inducing teams to engage in friendly competition with each other, the winners to be awarded medals, red flags, or other symbols of achievement. These types of incentives were employed through the period under study and continue to be an important element in motivating farmers to work. In spite of all the rhetoric

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[149] Chang Ho-wei, "The Worker-Peasant Labor System in Finance and Trade Departments," HCS, No. 1–2, Feb. 20, 1966; SCMM, No. 534, July 25, 1966, p. 24

[150] "An Example of Learning From Tachai by a High-Yield Area South of the Yangtze River," Peking, JMJP, Dec. 31, 1970; in SCMP, No. 4830, Feb. 3, 1971, pp. 88–91.

[151] "What is Meant by Joint Operation by Production Teams and Joint Operation by the Commune and the Production Teams?" Canton, NFJP, Sept. 19, 1965; translated in SCMP No. 3637 Feb. 14, 1966 pp. 17–20.

[152] "Democratic Activity Day" Welcomed by Cadres and Masses," Peking, JMJP, Apr. 8, 1966; in SCMP, No. 3682, Apr. 22, 1966, pp. 12–14.

[153] Socialist institutions are those in which the means of production are owned by "all the people," i.e. the State.

stressing the important of nonmaterial incentives in the socialist education movement, the Cultural Revolution, and the movement to criticize Lin Piao and Confucius, few teams give nonmaterial incentives the importance they had during the Great Leap Forward described in Section II above. While nonmaterial incentives are expected to become preponderant in the long run when material rewards will be minimized or eliminated, in the short run the value of material incentives has been respected.

Material incentives have provided the force which has induced farmers to produce from team fields. Many factors affect these incentives, but all factors cannot be treated in equal detail because of the paucity of data. For example, while it is well understood that farmer incentives can be raised by reducing the prices he has to pay for tools and fertilizer, it was not possible to obtain precise information on input prices teams paid for such items in the past 12 years. In the past few years articles in newspapers in China say input prices to teams have decreased 50 percent from 1952 to 1973, but no details were given as to the base from which the reductions were made.[154] [155] Similarly, incentives to farmers can be increased by raising the price the state pays teams for the goods it purchased. Some news articles recently reported procurement prices for agricultural and subsidiary products were raised by over 60 percent from 1952 to 1973.[156]

Furthermore, incentives to farmers can be affected by the availability and prices of consumer goods farmers can purchase with their earnings. Once again little information was found on this topic. The impression gained from the reports on communes is that more consumer goods are available to farmers now than at the beginning of the period. Finally, incentives to farmers can be affected by whether teams allow households to work private plots. Private plots and private production activity of households will be discussed below in the section on households.

Some of the most important factors in the material incentives system are those which (1) determine the relative share of income distributed to the state, the team and the household; and those which (2) determine the amount of income to be allocated to individual households.

With the lack of information it is not possible to provide a detailed account of the shares allocated to the state, the teams and household. It is important, however, to understand the processes involved in income distribution. To highlight important facets of the income distribution process an example will be employed. The mechanics of distribution can be seen operating in the example and the example will provide a general outline of how the shares of income are distributed. After the income distribution system has determined the residual income to be distributed, work payment systems actually allocate the residual income to individual households.

For the purpose of illustration, the average teams discussed above with 33 households, 145 persons, and 20 hectares will be used as a model

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[154] Chung Wen. Chung-kuo she-hui chu-i shih-ch'ang fan-yung hsing-wang" ("China's Socialist Markets Prosper"), *Ching-chi pao-tao* (Economic Reporter), No. 1401–1402, Jan. 1, 1975, Hong Kong, pp. 9–10.

[155] "Rural Collective Deposits and Savings of Commune Members Increase Markedly As a Result of Our Country's Ten Consecutive Years of Bumper Harvests, and Continuous Consolidation and Development of Collective Economy, and the Gradual Increase of the Income of Members," JMJP, Feb. 24, 1972; translated in SCMP. No. 5087. March 1972, pp. 69–70.

[156] *Ibid.*

team. The team's grain production is estimated to be 70 metric tons, and its income from all sources is calculated in terms of grain at 80 metric tons. At the end of the accounting period, income generated in the team is allocated to three entities: The state; the team; and the households.

The state figures prominently in team income distribution because, as has been mentioned previously, teams deliver grain to state tax stations to pay their agricultural taxes and they deliver prescribed quantities of grain, cotton, and edible oil seeds to state procurement stations. Since 1955, the Government has implemented a system in which areas producing a surplus of goods are required to sell their excess products to the state at fixed prices and the state bears the burden of rationing grain, cotton cloth, and edible oil to the population. Through planning and the accumulated performance of teams, the Government has come to expect certain teams to annually deliver a set quantity of grain under this system. The quantities of goods to be purchased is calculated as follows. Officials determine the productive capacity of the teams land to be 70 metric tons of grain. Next they calculate the consumption needs of the team as follows:

(1) 34.8 metric tons or 49.7 percent of grain production should be set aside to provide each of the 145 persons in the team with a grain ration of 240 kg per person; (2) 2.45 metric tons or 3.5 percent of the grain should be reserved for seeding next year's grain fields; (3) 4.2 metric tons or 6 percent of the grain should be allocated as fodder for livestock; and (4) 3.5 metric tons or 5 percent of the grain should be reserved by the team to pay its agricultural taxes. The supply of grain is then compared with the team consumption needs. If the supply is greater than team needs, the team is declared a grain surplus team and the state has the prerogative of purchasing up to 90 percent of the quantity in excess of needs. Assume that our model team produces as expected at its normal rate of 70 metric tons. When this amount is compared with the team's consumption rate of 44.95 metric tons, the team is declared a grain surplus team. The state can then purchase 90 percent of 25.05 or 22.55 metric tons. The state purchases this grain at a price which it fixes.[157]

At this step in the process of income distribution, the team has fulfilled its obligations to the state. The team has delivered to the state 3.5 metric tons as agricultural tax and another 22.55 metric tons as a compulsory grain delivery. The team is left with 76.50 metric tons of grain which consists of 53.95 metric tons of actual grain on hand and the value of 22.55 metric tons of grain sold to the state.

The team is the next entity to claim its share of gross income. The team lays claim to about 30 percent of the income, or 24 metric tons of grain to pay for production expenses. Another half a ton of grain (0.5 metric ton) is allocated to the team leaders and bookkeepers to remunerate them for the time they had to attend meetings and to do business for the team and could not earn labor days. About 10 percent of the team's gross income, or 8 metric tons is put into the team's capital accumulation fund and used to pay off principal and interest on production loans or to purchase machinery. The team's

[157] "Provisional Measures for Unified Purchase and Unified Supply of Grain in Rural Districts," NCNA, Peking, Aug. 25, 1955; translated in *Current Background*, No. 354, Sept. 7, 1955, pp. 7–14.

welfare fund receives 2 percent of the income (1.6 metric tons) and is used to help take care of the old, sick, and indigent and to help pay medical and education fees for some members of the team. These deductions total 34.1 metric tons and account for 43 percent of the team's income.

After the state and the team receive their respective shares of the income, the residual is distributed to households. The state's 3.5-metric-ton deductions plus the team's 34.1-metric-ton deductions leaves a balance of 42.4 metric tons which consists of 19.85 metric tons of actual grain on hand and the value of 22.55 metric tons of grain sold to the state. In our average team the households receive 53 percent of the gross income they generated.[158]

How the residual 42.4 metric tons of grain is distributed to households greatly affects incentives. In theory teams can distribute income to households using one of three payment systems: (a) On the basis of population (egalitarian); (b) on the basis of need (communist); and (c) on the basis of labor contributed to production (socialist). Evidence collected for this study reveals that teams, almost without exception, employed the work payment system (socialist) which correlated work done with income received. More specifically teams utilized the labor day work payment system. In this system the amount and quality of work done is measured and farmers are credited with labor days which serve as their claims on the expected profits, i.e., the residual income of the team. At the end of the agricultural year the number of labor days credited to all farmers and staff of the team are totaled and divided into the amount of residual income to obtain the value of 1 labor day. If our average team credited its members with 15,865 labor days then the value of one labor day would be 2.67 kg or 42.4 metric tons divided by 15,865 labor days. Thus if members of a household earned 480 labor days, the household would receive, 1,282 kg of grain as its income for the year, or 480 labor days time 2.67 kg.

An important part of the labor day work payment system is the measurement of work done by farmers. Seven methods were used to measure work done: Equality; assessment, fixed-rate fixed-assessment, fixed-rate flexible-assessment, piece-rate, labor contracts to individuals and households, and labor-production contracts to households.[159] These work measurement methods had been employed in agricultural producer cooperatives, collective farms, and communes prior to 1962 and continue to be used in the period from 1963–74.

A close examination of the operation of these measurements reveals two points: (1) Some methods were employed less frequently than others; and (2) those methods which were utilized frequently tended to provide for an egalitarian distribution of income among households in the team.

Among the less frequently used methods were the piece-rate, labor contracts, and labor-production contracts to households. Teams failed to use the piece-rate because of the difficulties involved in calculating labor norms and because of the difficulties team leaders and bookkeepers had in measuring the work completed and in calculating the

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[158] For additional example of how teams distribute income see, "How Chiaoli Production Team Distributes Its Income," vol. XXI, No. 9, September 1972, pp. 26–29.

[159] For a detailed account of the functioning of these work measurement methods see Frederick W. Crook. *An Analysis of Work Payment Systems Used in Chinese Mainland Agriculture, 1956 to 1970*, Ph. D. dissertation, Fletcher School of Law and Diplomacy, 1970; University microfilms, No. 72–2226, Ann Arbor, Mich., 1972.

labor days due each person. In the production-labor contract to household method, households were assigned responsibility for cultivating a fixed area of land or husbanding a fixed number of animals. The team guaranteed them a certain number of labor days for completing production targets and held out the promise that households could retain a fixed percentage of output in excess of the production target. While this method was used up to 1965 and did provide powerful incentives to farmers, the method also encouraged capitalist practices and so endangered the commune system that teams were forbidden to use it after 1965. In the labor contract work measurement method, teams made contracts with individuals or households to complete tasks, within a given time period, at a stated quality, in return for a predetermined number of labor days. This method was employed more than the labor-production contract method, but nonetheless was used sparingly because it also was thought to encourage capitalist-like behavior.

Work measurement methods which were employed and which tended to provide for an egalitarian distribution of income were the equality, assessment, and the two fixed-rate methods. In the equality method, the same number of labor days were issued to all those members who arrived for work, farmers not attending work received no labor days.[160] In the assessment method a meeting was held in which members assessed each other's work for a day or a period of time and determined the number of labor days each should received. In the fixed-rate fixed-assessment method members were classified into grades according to their level of work skill and capacity to work. Basic labor points were attached to each grade. At the end of each workday, those who worked simply received their basic labor points as work points (1 labor day is equivalent to 10 work points). After initially assessing grades, the actual work done was not assessed. The fixed-rate flexible-assessment method was established in the same manner as the method above. In contrast to the former, however, an assessment meeting was held and work done by members was evaluated Thus, even if a strong member had a fixed grade of 12 basic labor points, if he failed to do an adequate job in the minds of his team members, his work points for the day could be reduced.

The egalitarian tendencies of the equality method is obvious, but present in the other methods as well. Social pressures apparently worked when teams convened meetings to assess members' work or to fix basic labor points. The results of these meetings show that while there was a distribution of basic labor points or work points, the distribution was made within a rather narrow band. For example, instead of fixing basic labor points for young strong workers at 20 and elderly weak workers at 4, the differences were 10 for the strong and only 6 for the weaker members.[161]

The tendency for teams to distribute incomes on an egalitarian basis does not mean that incomes in the commune system or rural areas are the same. While teams members were willing to share income on a

[160] The equality work measurement method should not be confused with the egalitarian payment system noted above. In the latter, income was divided equally among all members regardless of whether they worked or not. In the former, only those who worked received payment.

[161] Mark Selden, "Report From a People's Commune," EH, vol. XII, No. 2, 1973, p. 45. Also see Martin K. Whyte, "The Tachai Brigade and Incentives for the Peasant," vol. VII, No. 16, Aug. 15, 1969, pp. 1–13.

more egalitarian basis with their close neighbors, and relatives, they do not seem to be as willing to share income with their compatriots in nearby teams.

Team and per capita income levels were found to vary from region to region, and even within the same brigade. Many factors account for these differences. Foremost is the fact that the team is the basic unit of account, and hence any differences in factors of production tend to be reflected in differences in levels of income. The fertility of farmland in China varies from place to place just as fertility levels vary in any country. Farmers living in a team located in the fertile Pearl River Delta in South China are likely to have higher incomes than farmers living in dry upland Shansi Province. Farmers living in teams which supply high-value vegetables and fruits to urban centers tend to have higher incomes than farmers living in teams in isolated mountainous regions.[162]

Other factors accounting for differences in team income levels include: (1) Management and bargaining skill of team leaders; (2) the quantity and quality of capital investments made in the team area prior to and after communes were organized; (3) nearness of transportation routes to market products and obtain supplies of inputs; (4) state investment in fertilizer plants, water conservation projects, and hydroelectric power generating stations; and (5) skills acquired by the labor force.

Households

Households currently number about 167 million and on the average have about 4.4 persons and 1.9 labor force units per household. (See Appendix II regarding estimates of household size.) As before, most households are allowed to engage in a limited amount of private sideline activity and cultivate private plots. Some areas discouraged these activities in the past 12 years [163] but Article 7 of the new Constitution gives commune members the opportunity to farm small plots of land for their own use and to engage in limited sideline production activities, provided that the collective economy in the commune system remains predominant.[164]

Private subsidiary production of households include such things as tending fruit trees and selling fruit,[165] weaving mats, bags, and baskets, making rope,[166] and bamboo articles.[167] Households also collect firewood for sale, and in one case panned for gold in a mountain stream.[168]

Households continue to work private plots and raise hogs and keep poultry as they did prior to 1963. Some teams, however, reported households had no private plots.[169] [170] Nevertheless, most households in rural China probably have a private plot. In most teams 5 percent

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[162] See the table on page 405, which illustrates these points.

[163] For example see: "We Must Have a Real Grasp of the 'Three Constantly Read Articles.'" KMJP, Aug. 19, 1970, Peking; translated in SCMP, No. 4729, Aug. 21, 1970, pp. 9–17.

[164] "Constitution of People's Republic of China," NCNA, in English, Peking, Jan. 19, 1975; in No. 1024, Jan. 31, 1975, pp. 14–25. Article 7.

[165] Robert Keatley, "Peasants Work Very Hard, But Life Is Tolerable and Living Costs Low," *Wall Street Journal*, July 7, 1971.

[166] "Make Concrete Analysis, Draw a Clear Demarcation Line," JMJP, Peking, Aug. 12, 1972; translated in SCMP, No. 5202, Aug. 24, 1972 pp. 144–148.

[167] Chen Han-seng, "Visit to Two Communes," CR, vol. XIII, No. 3, March 1964, pp. 18–20.

[168] Rewi Valley, *Travels in China, 1966–1971, op. cit.*, p. 191.

[169] Rewi Alley, *Travels in China, 1966–1971,* Peking, New World Press, 1973, pp. 143–145.

[170] Mark Selden, "Report From a People's Commune," EH, vol. XII, No. 2, 1973, pp. 37–50.

of the arable land is allocated for private plots.[171] On the average each household is allowed to cultivate about 300 square meters of land which is a plot of land about 57 feet square.[172] Table III, below, presents data gleaned from the reports on communes and at the same time indicates the variations in size of private plots in selected areas of China.

TABLE III.—SIZE OF PRIVATE PLOTS, 1963-74[1]

Unit	Year	Size of plot in square meters		Percent	
		Per head	Per household	Criterion for allocation theoretically in force	Actual criterion operating
Kwangtung:					
Pearl River Delta Commune[2]	1964		337		4–5
River Commune[3]	1964			5	3–4
Hsin Chiao Commune[4]	1965		122		4.1
National summary statement[5]	1966				5.0
Liaoning: Sinc Korean Friendship Commune[6]	1966	1,519	304		10.0
Shanghai: Ma Lu Commune[7]	1969	27			
Chekiang: Chiupao Commune, Chao Yang Brigade[8]	1968	55	269		9.0
Hopeh: Yueh Ke Chuang Commune, Sha Shih Yu Brigade[9]	1968		168		
Peking: Village near Peking[10]	1968	40			
Shanghai:					
Chengtung Commune[11]	1968	49	201		4.0
Rainbow Bridge Commune[12]	1971				7.0
Hopeh: Yueh Ke Chuang Commune, Sha Shih Yu Brigade[13]	1972	83	433		7.0
Peking: Sino-Albanian Commune[14]	1973	67	319	5	5.3
Shanghai: July 1st Commune[15]	1973	67	277		8.5
Kwangtung: Ta Li Commune[16]	1973	18	75		3.0
Shensi: Big Leap Commune[17]	1973	92	495		10.7
Peking: Double Bridge Commune[18]	1974	100			5–6
Shanghai:					
Tao Pu Commune[19]	1974	67			8.0
Tang Wan Commune[20]	1974	54	232		7.0
Kwangtung: Hsin Chiao Commune[21]	1974	13–34			

[1] Table III is patterned after table III in the definitive work on private plots from 1956–62 by Prof. Kenneth L. Walker, "Planning in Chinese Agriculture: Socialization and the Private Sector, 1956–1962," Chicago, Aldine Publishing Co., 1965, p. 25.
[2] Keith Buchanan, "Pearl River 1964," E. H., vol. III, No. 12, pp. 14–17.
[3] John C. Pelzel, "Economic Management of a Production Brigade in Post Leap China," in W.E. Willmott (ed.), "Economic Organization in Chinese Society," Stanford, Calif., Stanford University Press, 1972, p. 393.
[4] Ken Holliday, "Commune Life Proves Successful in Canton," The Star, Hong Kong, May 10, 1965.
[5] "Life in China's Rural People's Communes," N. C. N. A.—English, Peking, Feb. 19, 1966; in S. C. M. P., No. 3644 Feb. 24, 1966, p. 26.
[6] Robert Guillain, "When China Wakes," New York, Walker and Co., p. 112.
[7] F. E. E. R., July 1967, pp. 34–35.
[8] Rewi Alley, "Travel in China, 1966–71", Peking, New World Press, 1973, pp. 422–424.
[9] Rewi Alley, "Travel in China, 1966–1971", Peking, New World Press, 1973, p. 122.
[10] S. A. Christiansen, "Letters From a People's Commune," E. H. vol. VII, No. 3, 1968, pp. 42–48.
[11] Ian Davies, "The Chinese Communes—An Australian Student View," E. H., vol. VIII, No. 1, 1969, pp. 34–44.
[12] W. F. Wertheim, "Rainbow Bridge Commune Revisited," E. H., vol. X, No. 3, 1971, pp. 14–22.
[13] Union of Radical Political Economists, "Collective Notes of the First Friendship Delegation of American Radical Political Economists to the People's Republic of China," issued December 1972.
[14] Bruce L. Reynolds, "Observations on the Chinese Economy," New Haven, Dec. 1, 1973, p. 80.
[15] Ibid.
[16] Mr. and Mrs. Herbert L. Minich, American Chamber of Commerce in Hong Kong, "Trip to PRC," May 17, 1973.
[17] L. C. Schenk-Sandbergger, "How the Chinese People Remove Polarity Within their Countryside," E. H., vol. XII, No. 3, 1973, p. 16.
[18] "Visit to Double Bridge Commune," 1974, unpublished notes.
[19] "Visit to Tao Pu Commune," 1974, unpublished notes.
[20] Mr. Mark Hutten, "The Wongs of Shanghai," South China Morning Post, Hong Kong. Dec. 14 1974, p. 2.
[21] "Visit to Hsin Chiao Commune," 1974, unpublished notes.

Fruits and vegetables from private plots and the private raising of hogs and poultry continue as before to provide farm families with foods required for a balanced diet.[173] As before, income generated in

[171] "Life in China's Rural People's Communes," NCNA, in English, Peking, Feb. 19, 1966; in SCMP, 3644, Feb. 24, 1966, p. 26.
[172] See Appendix II calculations for households.
[173] Prof. Kenneth R. Walker in his definitive work on private plots prior to 1963 made these same points. See Kenneth R. Walker, *Planning in Chinese Agriculture: Socialization and the Private Sector, 1956–1962*, Chicago, Aldine Publishing Co., 1965, p. 41.

private production activity is an important supplement to total household income. At least 5 percent and probably about 10 percent of total household income comes from private plots since about 5 percent of the arable land is in private plots and households raise high value chickens and pigs, fruits, vegetables, and cash crops such as tobacco and castorbean seed.[174]

Sales of privately raised vegetables, hogs, and poultry provide households with an important source of cash income. As before, households gain some security from working in private production activity because it is an activity in which they can control the final output in contrast to their work in collective production in which the final outcome is the result of the labor and decisions of many other people. Manure from privately raised hogs and poultry continues to be an important source of fertilizer for collective fields. Finally, households continue to be China's most important source of supply for vegetables, rabbits, poultry, and hogs.[175]

In summary, households receive income from three sources. First, labor force units in households earn income by laboring in team fields and brigade and commune shops. Second, members of households receive some income from brigades, communes, and the state in the form of social services, as these institutions provide some subsidies to hospitals, clinics, and schools. Third, households earn income by producing handicraft items, by working at odd jobs, and by growing crops and rearing animals on their private plots. The vast majority of household income comes from cashing in labor days earned working in team fields or on team projects.

A limited amount of per capita and household income data was collected from the 1,400 reports. There was not sufficient income data to illustrate changes in income through time nor was there data to highlight difference in income levels between teams, brigades, communes, counties, and provinces. With the limited number of reports the best that can be done is to show per capita income differences between North and South China, and differences in income levels between persons residing in rural and suburban teams. While most reports did not provide clear explanations of income data, it is likely that the data was based only on residual income distributed to members, and did not include income from private production activity. Also it is likely that the value of the health and education benefits consumed by members likewise is not included in per capita income data.

It is well to note that the per capita income figure for each category was obtained by summing up all the income data through time and by dividing by the total number of reports. Luckily, reports containing information on income were quite evenly distributed throughout the whole period of study. Hence if the trends of increase in the incomes of various regions did not differ greatly, some general patterns of per capita income can be shown as follows:

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[174] Union of Radical Political Economists, "*Collective Notes of the First Friendship Delegation of American Radical Political Economists to the People's Republic of China,*" mimeographed, issued December 1972.

[175] Liu Hung, "Supplies Can Be Ensured Only When the Economy Is Developed," JMJP, Jan. 24, 1973; FBIS, *Daily Report: People's Republic of China, No. 22, Feb. 1, 1973, p. B–6.*

	Total	Rural	Suburban
North China	[20] 141.3	[16] 116.4	[4] 241.0
South China	[25] 154.8	[11] 134.5	[14] 170.8

Individuals working in suburban communes generally earned considerably more income, 27 percent in the South and 107 percent in the North, than persons in corresponding rural areas. Note should be made that only a limited number of observations were found for suburban communes in North China making it difficult to give great weight to the comparison between income levels in that category and other areas in China. Commune members in rural areas in South China generally earned 16 percent more than those in the North. Likewise, farmers in both rural and suburban communes in South China earned an average of 10 percent more than those in the North. Regarding differences between North and South, the pattern of income distribution noted in this study is consistent with that found by Professor Buck in his survey of the Chinese agricultural economy in the period 1929–33.[176]

IV. Economic Coordination and Decisionmaking in the Commune System and Prospects for Change

Because the team is the basic production unit, the key question with regard to decisionmaking in the commune system relates to the degree of autonomy at this level. To what extent are the team's decisions primary and to what extent guided? What are the factors leading toward the integration of the team into the state planning system and what are the factors which encourage its autonomy? What are the pressures that any given team leader must face as he plans for the economic well-being of this unit?

First, there are a series of pressures which combine to make the team organization a fairly autonomous decisionmaking unit and which limit, to some extent, the degree of flexibility in state planning. There are, for instance, physical constraints on state planning possibilities. Factors such as soil, climate, topography, the availability of water, and crop rotation patterns insure that many teams grow the same crops year after year. State directives might influence some of the alternatives, but the production pattern of many teams is predetermined by such physical constraints.

Second, there are what can be termed "social constraints" on higher level decisionmaking. The team leader, who actually makes the crucial production decisions, is torn, in a sense, between his obligation to state production goals, as handed down through commune and brigade levels, and his responsibility to his team to maximize its income. It is important to note that he is not an "outsider" brought in to administer state plans, but is an integral member of the team. His decisions affect his own income and that of his close friends and relatives. He is an intermediary between the state, on one hand, and neighboring house-

[176] John Lossing Buck, *Land Utilization in China*, Nanking, University of Nanking, 1937; reprint, Paragon Book Reprint Corp., New York, N.Y., 1964, see pp. 46, 286, 305 and 470.

holds on the other. He must cater to the former while continuing to work and live with the latter. Any analysis of decisionmaking in the commune system must recognize the divided loyalties of the team leader and the careful balancing of priorities which must exist at this basic level.

Along with physical and social constraints, there are institutional constraints on the degree of influence higher level officials have on the team. Of all the factors leading toward autonomy at the team level perhaps the most important concerns the fact that the team is the unit of account. In a sense it resembles the private firm in a capitalist society. It is responsible for its own profitability. Thus team members are not paid by the state. If they are influenced to make erroneous production decisions by higher levels, they suffer the loss in income. Thus they are less tractable than if they were state employees.

In addition, the team distributes income among its members. It operates under a type of "honor system" in its payments of grain tax and in its deliveries of grain purchases to the state much the same as a firm in the United States is obligated to pay its taxes. Police powers can be invoked but not in every individual case. If the state is occupied with other campaigns, then a relaxation of control at the top occurs and the mobilization of pressure at the team level becomes more difficult.

Finally the state itself has recognized the importance of the team in agricultural production and has imposed restrictions on the intervention of higher levels into the affairs of this basic unit. For instance, a commune or brigade can no longer take labor force units arbitrarily out of the teams for its own projects (such as occurred numerous times during the Great Leap Forward period). The three principles which are to govern the interrelations between levels are: (1) Volunteerism; (2) mutual benefit; and (3) exchange at equal value. All three principles serve to protect the team from overzealous cadres at higher levels from commandeering their resources and disrupting their production processes.

In sum, there seems to be a willingness at very high levels to recognize the productive value of the team and to protect its autonomy by (a) making it the unit of account; and (b) by establishing administrative barriers to higher level interference in its affairs. This fact, combined with the physical and social factors listed above, combine to insure a high degree of autonomy for the team.

However, there are developing institutions and services at the commune and brigade levels which increasingly involve the team in coordination and planning activities at these levels and consequently limit its autonomy. First, although the typical team leader is probably not a member of the CCP, he has undoubtedly been influenced by Party doctrine with regard to agricultural collectivization and the building of socialism in the countryside. He is also aware of the great potential for intervention in his affairs by Party and militia leaders. Moreover, he knows that he must obtain the necessary agricultural inputs to maximize production. These are, to a large extent, controlled by state entities and by the commune and brigade organizations. If he is not responsive to higher level planning, he may find himself without the necessary fertilizer, machinery, or even electricity to carry on his production functions.

He is also aware that credit facilities are controlled by the state. It is unlikely that recalcitrant teams are given first priority when investment loans are decided upon. Then, too, he knows that excellent employment opportunities are sometimes available in commune and brigade level industries if cooperation with these units is forthcoming on his part.

Finally, he is keenly aware of the important services controlled by higher levels such as health, education, and transportation facilities. He is undoubtedly interested in insuring maximum utilization of these services for his team members.

All of these factors, i.e., respect for national goals and fear of massive state power; need for agricultural inputs; and desire to utilize higher level credit and service facilities; encourage the team leader to comply with state agricultural planning.

Prospectus

During the last 12 years, the team has been the basic unit of Chinese agriculture. There is likely to be no important changes in this regard for the next 5 years. Chinese agriculture is labor intensive and the team is the best-sized unit for organizing and mobilizing the labor force to perform the myriad of tasks involved in this type of agriculture.

There has, however, been significant growth in influence from the brigade and commune levels simply by virtue of the additional agricultural inputs and services provided by these levels. If the regime wished to make the brigade the unit of account, it would be in a better position to do so now than it was during the Great Leap Forward period. A generation of peasants have now matured under the commune system. (An 8-year-old in 1959 is 24 in 1975 and able to assume responsibilities within the system.) It is, indeed, a familiar structure to the great majority of rural families. In addition, there are better managerial skills available at the commune and brigade levels now than in 1959–61.

However, it is the judgment of this researcher that the team will remain the primary unit for the near future. The new Constitution envisions no change in the present structure of agricultural organization. Indeed, there is little incentive to change the system, as agricultural production, so necessary to the regime's long-term plans, has fared well under the present arrangement.

APPENDIX I

To collect information for the report—a search was made of Chinese news releases (newspapers and radio broadcasts) from 1963 through 1974. Trip reports from foreign visitors also provided some information.

Information was collected on the name of the commune, its geographical location (province and county), and its proximity to cities. The number of brigades and teams in the commune was listed as was data on the number of households, population, and labor force units. The amount of arable land in the commune or subordinate units was noted along with data on the percent of arable land planted to various crops and percent of total arable land irrigated. Information was collected on the production of various crops and animals raised in the commune. Income distribution data, per capita income, value of labor days, percent of gross income from crop, livestock, fish, forestry, handicraft, and light industrial production, and allocations of gross income was collected. Information on private plots was noted. Information describing relations between the Party, Government, and commune was carefully gathered. Particular effort was made to obtain information describing relations between the commune and its subordinate units. Finally, notes were made on the following topics: Militia, health, welfare, child care, supply and marketing co-ops, credit co-ops, transportation, agricultural extension, subsidiary production (oil press, cotton ginning, brickmaking, etc.), water control and conservation, mechanization and grain reserves.

Some assistance in locating reports on communes was provided by Richard Baum's "Bibliographic Guide to Kwangtung Communes 1959–1967," Hong Kong, Union Research Service, 1968; and by "Jen-min kung-she tsung-lan (General Survey of the People's Communes)," Tokyo, Asia Research Institute, January 1965. Limited use was made of these admirable collections because most of the references in these works were for communes prior to 1963.

Prof. Richard Yin and David Denny also provided valuable guidance in the initial research stage when reports were being collected.

In the footnotes to this paper, the following abbreviations are used:

CB	*Current Background*, American Consulate General, Hong Kong.
CNA	*China News Analysis*, Hong Kong.
CQ	*China Quarterly*.
CR	*China Reconstructs*, Peking.
CS	*Current Scene*, U.S. Information Service, Hong Kong.
EH	*Eastern Horizon*, Hong Kong.
FEER	*Far Eastern Economic Review*, Hong Kong.
FBIS	*Foreign Broadcast Information Service*, Washington, D.C.
HCS	*Hsin chien she* (*New Construction*), Peking.
HHYPP	*Hsueh-hsi yü p'ipan* (*Study and Criticism*), Shanghai.
HC	*Hung-ch'i* (*Red Flag*), Peking.
JMJP	*Jen-min jih-pao* (*People's Daily*), Peking.
KMJP	*Kuang-ming jih-pao* (usually not translated), Peking.
MTTC	*Min-tsu t'uan-chieh* (*Nationalities Unity*), Peking.
NCNA	New China News Agency.
NFJP	*Nan-fang jih-pao* (*Southern Daily*), Canton.
NYCHCS	*Nung-yeh chi-hsieh chi-shu* (*Agricultural Machine Technique*), Peking.
TYP	*Ta-kung pao* (*Impartial Daily*), Hong Kong.
SSST	*Shih-shih shou-tse* (*Current Events*), Peking.
SCMM	*Selections from China Mainland Magazines*, American Consulate General, Hong Kong.
SCMP	*Survey of China Mainland Press*, American Consulate General, Hong Kong.
SPRCM	*Selections from People's Republic of China Magazines*, American Consulate General, Hong Kong.
SPRCP	*Survey of People's Republic of China Press*, American Consulate General, Hong Kong.
WHP	*Wen-hui pao*.

Appendix II

Listed below are the source materials and calculations used to estimate size and number of units in the commune system. It is well to remember that the end products are estimates and should be regarded as general rules or guidelines to assist students to better understand China's rural economy.

Population

John S. Aird's midyear population figure for 1974 of 920 million was used. See Foreign Demographic Analysis Division, Bureau of Economic Analysis, Social and Economic Statistics Division, U.S. Department of Commerce, "Estimates and Projections of Population of Selected Countries of the World: 1950–1990," May 1974.

Rural Population

Members of China Academy of Agriculture and Forestry Sciences told Dr. M. E. Ensminger that 80 percent of China's population was rural. See M. E. Ensminger and Audrey Ensminger, "China—The Impossible Dream," Agriservices Foundation, Clovis, California, October 1973, p. 197.

Size of Rural Households

Data collected from the reports on 1,400 communes indicate that the average size of households in terms of persons was about 4.4. This average corresponds closely to an average derived from estimates made by Ta-chung Liu and Kung-chia Yeh, "The Economy of the Chinese Mainland: National Income and Economic Development, Princeton, N.J., Princeton University Press, 1965, p. 102,

Number of Communes

The report "Growth of Commune Clinics Shows Emphasis on Rural Health," NCNN, Peking, in English, June 25, 1973; in FBIS, Daily Report: People's Republic of China, No. 123, June 26, 1973 p. B–1, indicates China has about 50,000 communes.

Number of Brigades

Edgar Snow reported in 1971 that there were 750,000 brigades, op. cit., p. 138.

Number of Teams

A 1966 TKP report said there were about 5 million teams. Liu Shen, Pen Shui-li yao kuan-ch'e hsiao hsing-wei chu te fang-chen ("In Water Conservancy, Take the Direction of Undertaking Small Sized Projects"), TKP, March 11, 1966, p. 3.

Arable Land

Total arable land was reported by the State Statistical Bureau to be 107 million hectares. See State Statistical Bureau, "Ten Great Years—Statistics on Economic and Cultural Achievements in the People's Republic of China," Peking, Foreign Languages Press, p. 2. Communes are said to cultivate 95 percent of this land. See Wang Hsiang-ch'un, Chiang Hsing-wei, and Ch'en Kun-hsiu, "The Question of Planned Management of Agricultural Production in Our Country," Ching-chi yes-chiu (Economic Research), No. 3, March 20, 1965; translated in SCMM, No. 466, April 26, 1965, pp. 31–39.

Thus 95 percent times 107 million hectares equals 101,650,000 hectares cultivated by communes. State Farms are estimated to cultivate not more than 4 percent of arable land. See Audrey Donnithorne, "China's Economic System," op. cit., p. 96.

Calculations for Communes

1. Rural populations of 736,000,000=920,000,000×80 percent.
2. Persons per commune of 19,920=736,000,000 rural persons÷by 70,000 communes.
3. Households per commune of 3395.5=14,125÷4.4 persons per household.
4. Brigades per commune of 15.7=750,000 brigades÷50,000 communes.
5. Teams per commune of 100=5,000,000 teams÷56,000 communes.
6. Arable land per commune of 2,032=101,650,000 hectares÷70,000 communes.

Calculations for Brigades

1. Teams per brigade of 6.7=5,000,000 teams÷750,000 brigades.
2. Persons per brigade of 981=736,000,000 rural persons÷750,000.
3. Household per brigade of 233=981 persons÷4.4 persons per household.
4. Arable land per brigade of 136=101,650,000 hectares÷750,000.

Calculations for Teams

1. Persons per team of 147=736,000,000 rural persons÷5,000,000 teams.
2. Households per team of 33=147 persons÷4.4 persons per household.
3. Arable land per team of 20=101,650,000 hectares÷5,000,000.

Calculations for Households

1. Rural households of 167 million=rural population of 736 million÷4.4.
2. Data collected from the reports on 1,400 communes indicates that on the average a rural household had 1.87 labor force units.
3. Average size of private plots of 300 square meters was derived as follows. Private plots are said to account for 5 percent of arable land in communes. See "Life in China's Rural People's Communes," NCNA, English, Peking, February 19, 1966: in SCMP February 24, 1966, p. 26. Arable land in communes was calculated above (Arable Land) to be 101,650,000 hectares, and 5 percent of this figure would leave 5,082,500 hectares for private plots, and this quotient divided by 167 million rural households leaves each household with 0.03 hectares. One hectare has 10,000 square meters, hence 0.03 hectares would equal 300 square meters, which would equal 0.074 acres (1 hectare=2.471 acres and 1 are=100 square meters=0.02471 acres), which would equal 3,222 square feet of land or a square plot of land about 57 feet on a side.

RURAL INDUSTRIALIZATION IN CHINA

By Jon Sigurdson

Introduction

The encouragement of small-scale industries in rural areas in China is an essential element of regional development programs which today focus on agricultural development and diversification, local raw material utilization, resource mobilization, and long-term employment impact. However, rural industry in China is not a homogenous concept, as it is the outcome of two different strategy approaches. First, it is the logical outcome of a sector strategy involving technology choices in a number of industrial sectors—most of which were initiated during the great Leap Forward or earlier. This has required the scaling down of modern large-scale technology through a product and/or quality choice combined with design changes in the manufacturing process.[1] Second, rural industry is part of an integrated rural development strategy—also initiated during the Great Leap Forward—where a number of activities are integrated within or closely related to the commune system. They are often rooted in the traditional sector of the economy and have often been preceded by a long tradition of village crafts. Such industries are often based on the scaling up of village crafts. The scaling up of cottage industries in China is not based on improvement of technology alone, but the cottage industries have been converted into modern small-scale industries through cooperativization, electrification, and access to low-cost simple machinery. The assumption for both categories is that they, in the main, should be using local resources and should be meeting a local demand for producer goods and industrial services.

Consequently, the rural industrial sector in China consists of enterprises which vary greatly in size and in degree of technological sophistication. The total number of enterprises is very high. The largest category consists of the very small brigade-level repair and manufacture shops, of which there may be several hundred thousand. The second largest category is likely to be the small mines—or mining

[1] The best-known examples are small-scale production of nitrogen chemical fertilizer, cement and iron, all of which are discussed at some length in a forthcoming monograph on Rural Industrialization in China, to be published by East Asian Research Center, Harvard University, by the author. For a theoretical discussion of the issues involved, see Ishikawa, Shigeru.: A note on the choice of technology in China; the Journal of Development Studies, 9(1), 161–86, 1972.

spots—of which there are likely to be considerably more than 100,000. There are also 50,000 small hydroelectric stations. A large number of the 50,000 communes are likely to have their own workshops for grain milling, oil pressing, and other food processing plants, woodworking shops, et cetera, which are usually organized in multipurpose units. Rural heavy industry—small iron and steel plants, cement plants, chemical fertilizer plants, and other chemical plants—may amount to between 5,000 and 10,000 units. The number of county-run machinery plants may amount to more than 3,000 units. Then there is also a large number of light (consumer) industry enterprises in counties, communes, and brigades, and these may amount to more than 100,000 units. So, the total number of industrial units—within the rural industrial sector—is likely to be in the region of 500,000 or more.

However, total rural industrial employment is still limited and total employment is estimated to be in the region of 10–17 million, which may correspond to approximately 50 percent of total employment in manufacturing and mining. Since the summer of 1973, a couple of provinces have indicated clearly that, based on local conditions and relevant instructions from higher authorities, the number of workers used by industries at county, commune, and brigade levels should not exceed 5 percent of the labor force in a county.[2] All other available information indicates that this may be the upper limit today.

China has not released any national figures for employment in county-, commune-, and brigade-level enterprises. There can be no doubt that employment in various parts of the county differs widely. Rural areas which are under the administration of big industrial cities have 20 percent or more of the labor force in industry. Remote places in the interior of the country may have hardly any industrial activity. Information from a number of relatively well developed (in terms of rural industrialization) regions in Hopei province indicates that less than 5 percent of China's total labor force is engaged in rural industries. The Chinese labor force is estimated to be approximately 350 million, which is about 70 percent of the population between the ages of 15–64.

Rural industry is distributed within a county at brigade, commune, and county level, with the heavy industry and larger enterprises located in the county capitals. The larger county capitals usually would not have a population exceeding 20,000. Most of the rural industrial enterprises are relatively small, rarely exceeding a few hundred employees. When discussing rural industry in China, it is essential to realize that many of them are not small by international classification and that many of them are located in small urban centers—county seats with a population of up to 20,000—which are not considered rural areas according to international classification. Rural industry is in this context not defined on the basis of size but as any local industry run by county, commune, or brigade. The enterprises are collectively owned or wholly owned by the state but under local management.[3] Rural industry also includes units attached to middle schools, hospitals, and health clinics.

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[2] Information provided by officials of Lin County Industrial Bureau, Honan Province, Summer 1973.

[3] The collectively owned enterprises may be jointly financed by the state and collective units.

Rural industry in China forms one part of the small-scale industrial sector which basically is made up of two different parts. (The other is the urban small-scale industrial sector, which is not discussed here.) The sophistication and scope of industrial activities are dependent on the level of education, economic development, natural resource endowment, nearness to ideas, and new information. Consequently, it is realistic to differentiate between rural industry in near-city locations and rural industry in rural areas proper. The former seems to have much more in common with urban-based small-scale industry than is the case for the rest of rural industry.

The development of industries in rural areas around Shanghai, Peking, and Tientsin, with a substantial amount of subcontracting, may indicate the long-term prospects for rural industry in the rest of the country. The formation of technical and organizational skills is only in the early stages of development in most parts of rural China. This and the still low level of mechanization explains why the industrial level in most rural areas in China is still comparatively low compared with more favored rural areas around the big cities.

Industrialization in rural areas proper appears to have been successful only when local character has been stressed. In other words, those activities, which have high coefficients for backward linkages to agriculture and for forward linkages to final users in the localities have been successful. A distinct difference between the approaches to rural industrialization in the late fifties and in the period since the Cultural Revolution is that the latter approach appears to have much higher coefficients for forward and backward linkages in the locality.

It seems that the greatest merit of small enterprises, as experienced in China, lies not in the superiority of their capital/labor or capital/output ratios but in the overall savings in resources they make possible.[4]

Rural industry is part of a communication network which has the important task of spreading innovations as quickly as possible within a local technology system. New things and ideas often look complicated to an outsider, and, therefore, people have to be able to ask questions, to test things and ideas, and to get a feeling for them in order to fully understand and accept them. A tightly meshed network is a consequence of the fact that the links of personal communications are heavily restricted by distance for most individuals. Personal communication between pairs of individuals and direct observation are still the basic instruments for the diffusion of innovations.

Furthermore, small-scale industries serve as an important training ground for peasants who are learning manufacturing skills. The peasants are aided in adapting to an industrial environment and to conditions found in larger enterprises. This training contributes to the local formation of technical and organizational skills, and is part of a general process of breaking down the barriers to a transition from a

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[4] Watanabe argues that "small enterprises seem to contribute most to the economic development of countries with surplus labor and shortage of capital (which applies to China at her present stage of development) under the following conditions:

"(1) Where they can be set up without heavy overhead capital expenditure on buildings, land, and infrastructure;

"(2) Where the diseconomies of small enterprises are compensated by the use of idle capital, labor, and raw materials;

"(3) Where division of labor between enterprises in different size groups, e.g. in the form of subcontracting, enhances the overall efficiency of the industry."

(In "Reflections on Current Policies for Promoting Small Enterprises and Subcontracting", by Watanabe, Susumu; International Labor Review, vol. 110, No. 5, November 1974).

traditional to a modern economy. Consequently, rural industrialization has positive implications for the social development of the country. This is apparently one of the major reasons why the leadership has attempted to make rural industries reach almost every corner of the country.

Rural industrialization still has a relatively limited impact on the employment pattern. However, the sector engages approximately 3 percent of the total number of people of working age. Another 2 percent are engaged in the mass scientific network in rural areas.[5] Consequently, 5 percent of the working age population in rural areas actively are engaged in activities which are likely to have a strong impact, not only on productivity, but also on the mental outlook in rural areas.

The Sector Strategy

Substantial industrial activities are today included in integrated rural development programs centering on the communes, including their subunits and the higher administrative levels of counties. This approach is likely to have great significance for future decentralization of industry and rural development. The small-scale process plants, which are usually parts of the integrated rural development programs, have attracted considerable attention in China as well as outside the country. It is of interest to discuss their justification, particularly as they continue to play an important role in some industrial sectors. Small-scale nitrogen fertilizer and cement plants are the most obvious examples of our discussion.[6] Sector strategy choices have in the past been made in almost all industrial sectors of which the iron production in "backyard furnaces" is the best known example, but probably one of the least successful examples of Chinese technology choices.

The concern of a dual approach—the two-leg policy—of the Great Leap Forward was based on two assumptions. First, that techniques existed or could easily be developed whereby labor could be substituted for capital, enabling better use of China's abundant manpower resources. Second, the increased industrial production would boost the capacity of the modern industrial sector and meet the stringent requirements for quality and specifications in that sector. These assumptions were clearly incorrect in most sectors. However, a dual strategy persists in a number of sectors, and it has often been assumed that the Chinese rural, small-scale industrial enterprises provide a textbook example of choices of technique.[7] Such an assumption may be correct if one looks at the industrial system as a whole—including mining of raw materials, and transportation. However, the assumption does not appear to be correct for the core industrial processes.

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[5] It was recently reported that over 10 million people now take part in scientific experiments in rural areas. There are also experimental stations and groups in most rural people's communes and production brigades. (China Develops Science and Technology Independently and Self-Reliantly, Peking Review, No. 46, 1974, p. 14.)

[6] The number of small-scale chemical fertilizer plants was in early 1974 around 1,800 of which approximately 1,000 produce nitrogen fertilizer and the others phosphate fertilizer. Average annual production is today 8,000 tons of ammonium bicarbonate (NH_4CO_3) in a small-scale nitrogen fertilizer plant.

The number of small cement plants in rural areas has increased from about 200 in 1965 to 2,800 in 1973. The production capacity of the small cement plants increased during the same period from roughly 5 million tons to an estimated 19 million tons. Consequently, the average size of the plant has decreased considerably—from about 25,000 tons per year in 1965, to 6,800 in 1973.

[7] An economic analysis includes the following statements:

(a) Inferior techniques are those which produce the same output as some other technique using more of at least one factor and no less of any other.

(b) Efficient techniques are those which are not inferior to any other techniques among those available.

By limiting the discussion to the use of two factors—capital and labor—the choice of technique in most alternative small-scale units in a number of important industrial sectors cannot be explained. The rural industries certainly use more labor and most of the rural process industries have higher capital/output ratios than alternative large-scale counterparts. However, this means that Chinese economic planning also considers other criteria which will be evident from the cement and nitrogen fertilizer production.

We assume T_0 in figure 1 to be the modern technique used for the manufacture of an industrial product at a certain point in time. The likely development of this technique in developed countries would be in the dotted area (II), because of relative abundance of capital and rising labor costs. It would be in the interest of developing countries to have a development in the shaded area (III), to make better use of scarce capital resources and abundant manpower resources.

Using available plan prices it appears that the alternative (small-scale) techniques being used in a number of Chinese industrial sectors would fall in the remaining area (I). This would indicate that they are inferior techniques, perhaps partly reflecting the considerable economies of scale which affect process industries. There can be no doubt that, in a strict economic sense, many alternative techniques used in Chinese process industries are inferior, using available Chinese plan prices. However, they may be efficient when seen as interacting components in a local industrial system.

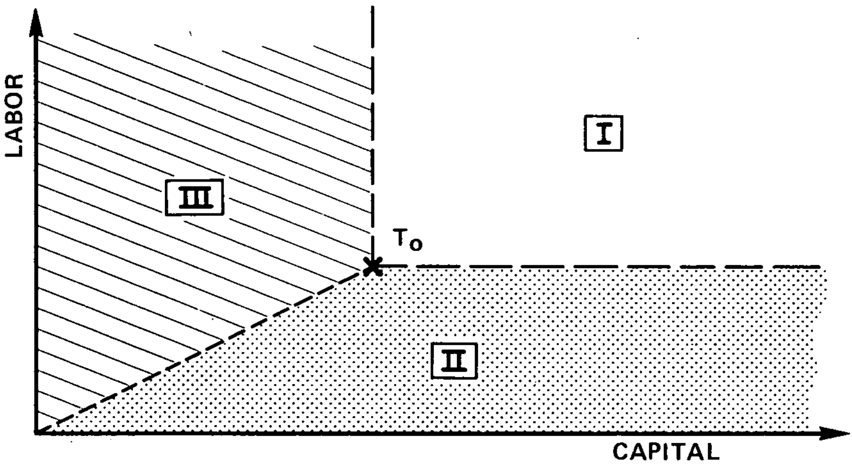


Figure 1. Technology development and capital/labor ratios.

Nitrogen Chemical Fertilizer[8]

China has four main options in providing her agriculture with nitrogen chemical fertilizer.[9] First, fertilizer can be imported. Second, large plants for making fertilizer can be imported. Third, China can manufacture her own large-scale plants for producing nitrogen fertil-

[8] The early overall development of China's fertilizer industry is described in "China's fertilizer economy" by Jung-chao Liu, Edinburgh University Press, 1971.

[9] It should be noted that a considerable amount of the nitrogen intake comes from nonchemical fertilizers. However, it is virtually impossible to quantify the contribution of nonchemical fertilizers to total nutrient intake, but it seems likely that, until the early seventies, it probably exceeded, on average, the amount provided by chemical fertilizers.

izer. Fourth, China can continue to construct small-scale plants to be spread all over the country. Some of the characteristics for the four different options, all of which have been exercised in the past, are enlisted in table 1.

TABLE 1.—ALTERNATIVES IN PROVIDING NITROGEN CHEMICAL FERTILIZER

	4	3	2	1
Product origin	Domestic	Domestic	Domestic	Foreign.
Plant origin	do	do	Foreign	
Plant size	Small	Large	Large	
Plant location/market	Local	Central	Central	
Technology	Modern	Modern	Modern	

As shown in table 2, China has imported very large quantities of nitrogen chemical fertilizers. The country has been the single largest buyer of chemical fertilizer in the world market. The figures below would indicate that approximately 50 percent of China's consumption of nitrogen fertilizer in 1970–71 was covered through imports. Considering the domestic plan prices for electricity and equipment, it has been advantageous for China to supply imported fertilizer to certain areas of the country—mainly the coastal provinces and areas which could be reached by railway or water transportation. Nitrogen chemical fertilizers have been available in the world market at very low prices—roughly $40 (f.o.b.) per ton of urea, for example. However, the cost of petroleum feedstock has raised production costs by about 150 percent since the beginning of 1973. Furthermore, the present imbalance between demand and supply has pushed the price much higher, and urea is presently (June 1974) sold at approximately $300 per ton.[10]

TABLE 2.—*China's fertilizer imports in recent years* [1]

	Million tons nitrogen
Contracts for 1970–71	1, 785
Contracts for 1971–72	1, 601
Contracts for 1972–73	1, 153

[1] Review of the fertilizer market in the People's Republic of China, the British Sulphur Corporation Ltd., London 1972 or 1973.

The second alternative for providing the agricultural sector with increased amounts of chemical fertilizer is to import complete plants. This option has been exercised in the 1950's when plants were bought from U.S.S.R. and again in the mid-1960's when a couple of plants were bought from Western Europe and Japan. The situation which the planners have to deal with has once more become ripe for the import of chemical fertilizer plants. Several factors appear to have contributed to the new situation. First, the rapid price increase for chemical fertilizer in the world market has made the import option the least favorable one. Second, availability of domestic petroleum feedstock in relative ample quantities has tilted the balance in favor of the large-scale modern plants which, in the short run, only could be obtained through imports. Third, the prospects for increased foreign exchange earnings may have improved considerably in recent years because of the development of the petroleum industry and the more mature industrial base which now exists in China. Fourth, the country may experience an urgent need to rapidly increase agricultural productivity in order to provide more raw materials for domestic industry and exports.

[10] Information provided by the Swedish manufacturer of nitrogen fertilizer—SUPRA in Landskrona.

As a consequence of deliberations which can at present only be vaguely indicated, China has, since the beginning of 1973, contracted ammonia urea plants with a total annual production capacity of 3.78 million tons of ammonia. That amount exceeds the total domestic production of nitrogen in 1973. The total cost for these plants amounts to \$442 million, with an average price of \$36.8 million. The plants are among the biggest in the world today, each with a daily production of ammonia of approximately 1,000 tons or more, which more or less equals the output of 100 small plants. When these plants go into production, starting in 1976, the share of production coming from the small-scale fertilizer plants will be considerably reduced.

The small-scale plants have played an increasingly important role in providing Chinese agriculture with nitrogen since the mid-1960's. The decision to base China's development strategy on a dual approach was reached before the Great Leap Forward was formally launched in early May 1958. This is evident from the following quotation from a news item in April of that year.[11]

> An 8,000-ton nitrogenous fertilizer plant as designed by the Ministry of Chemical Industry, together with its auxiliary electric power station can be built in less than half a year with an investment of 3.5 million yuan. This is within reach of a county. If half of the country's over 2,000 counties built one such plant each it would mean an increase of 8 million tons of nitrogenous fertilizer in a year.

The small plants existing today differ considerably in size. The idea of small nitrogen fertilizer plants originated in the new economic planning of the late fifties which manifested itself in two different development approaches. First, the counties and regions should establish their own fertilizer factories. Second, fertilizer production and most other industrial activities should be located in the people's communes which were established in the autumn of 1958. The latter approach was thought to justify a smaller plant, with an annual production of 800 tons of ammonia. Technical deficiencies and the very high costs of production led to the closing down and redesign of these very small plants. With very few exceptions, small plants were also transferred to county-level control. The other two basic designs of the Great Leap Forward period have also undergone changes. The smaller plants have been expanded to a standardized unit of 3,000 tons capacity. A plant of this size is usually expanded to an annual production of 5,000 tons ammonia as soon as the demand develops and the technical problems have been overcome. Larger plants with an annual production capacity of 10,000–15,000 tons are today found mainly in counties which are economically well developed and cover relatively larger areas. These areas include Kwangtung province in the South, and rural areas of Shanghai. The different plant sizes are listed in table 3.

TABLE 3.—*Small-scale nitrogen fertilizer plants*

	Size (tons) (Annual production of ammonia)
Great Leap Forward design for commune-level plants	800
Standard design in 1958 for county-level plants	2,000
Standard design in 1960's and 1970's for county-level plants	3,000
Modified version of the 3,000-ton plants (expansion is usually carried out in a 2d stage)	5,000
Standard design in 1958 for region-level plants	8,000

[11] Standard blueprints for local industry, New China Agency, Mar. 19, 1958. (In Survey of China Mainland Press No. 1739.)

After the rehabilitation of the economy in the early 1960's, the central government again started to pursue a policy of decentralization of fertilizer production by encouraging the construction of very small fertilizer plants with an annual production of less than 10,000 tons of ammonia. Almost all of the existing small nitrogen fertilizer plants produce ammonia as an intermediate product which is then converted into ammonium bicarbonate NH_4HCO_3).

The plants of the late sixties and early seventies are similar to those which had first been built in the late fifties and early sixties. At that time, the technology was not sufficiently good to make them a successful venture. Another serious hindrance may have been the fact that trained manpower was not available. The conditions during the late sixties were much better and made it possible for the plants to be constructed in large numbers and to operate with reasonable efficiency.

Consequently, the share of the small-scale plants has increased rapidly from about 12 percent in 1965 to 54 percent in 1973 of a total nitrogen production of 15 million tons with nutrient content of roughly 20 percent.[12] The share of the small-scale plants may continue to increase for another year or two and will then drop drastically when the very large imported plants go into production. The development of the small-scale nitrogen chemical fertilizer plants—as shares of total production—is given in table 4. It may be noted here that China in 1973 produced almost 8 million tons of nitrogen chemical fertilizer in approximately 1,000 small plants located in half of the counties. This was the goal envisaged by the planners in 1958 and referred to in the earlier quotation.

TABLE 4.—ESTIMATED CHEMICAL FERTILIZER PRODUCT IN CHINA[1]

[In metric tons]

Year	Total N+P	N	Small-scale production					
			N+P Total	Percentage	Number of plants	N total	Percentage	Number of plants
1965							[1] 12	
1966						1.29		
1967								
1968								
1969	9.68		×					
1970	14.00		[1] 2.3 ×				[1] ≈40	
1971	16.83	9.01	10.00	[1] ≈60		3.87	[1] 43	[1] ≤700
1972	19.88	11.93	11.93	[1] ≈60	[1] ≈1.400	5.97	[1] >50	[1] >800
1973	26.44	15.31	16.61	63		8.26	[1] 54	[1] ≈1,000

[1] The figures and percentages have at various times been published by Chinese news media but are somewhat ambiguous. All others are estimates based on the reported information. See forthcoming monograph by the author for specific references.

The small scale-nitrogen fertilizer plants are today found almost everywhere in China. A few plants may even have been located where raw material is not available, where the technical base does not exist or where other necessary conditions for an efficient use do not exist. The setting up of new plants today requires a careful screening procedure at provincial level after the national authorities have made their

[12] The small-scale plants accounted for a considerably larger share of phosphate fertilizer production (around 75 percent) in 1973. Economics of scale are less pronounced for the types of phosphate fertilizer usually produced in small-scale plants in China today.

allocation of plants to the various provinces. All of the following points are usually taken into account when the provincial authorities decide if a particular county should set up a small nitrogen fertilizer plant.

1. Size of the county (market).
2. Need to rapidly increase agricultural production (potential results).
3. Availability of industrial knowledge in order to guarantee production.
4. Availability of irrigation water to guarantee efficient use.
5. Access to electricity and process water.
6. Access to transportation for raw materials and finished products.
7. Ratio between cultivated area and population. A high ratio usually gives priority because of difficulties in providing sufficient amounts of manure.

The policy of decentralization of fertilizer production has had the effect of reducing costs to the central government and placing some of the burden on the rural areas which provided part of the necessary financing. The policy of small-plant construction was formulated in order to utilize local resources to an increasing extent and to relieve the transport system of as much fertilizer material as was feasible. Their construction involved the use of equipment manufactured in more or less centralized workshops and the services of technicians from elsewhere, but once the staff was trained and the plant started up, the new production facility was expected to be run by local people, using local raw materials.

The proper choice of raw material is a critical factor in minimizing the burden on the transport system and maximizing the use of local resources. Consequently, the small-scale fertiizer plants have been designed for different raw materials such as coke, brown coal, coke oven gas which were the traditional raw materials in the late fifties and early sixties. Most of the early small plants were designed to use coke. This was a result of the rapid proliferation of local coke ovens, a movement which at the time was tied in with the local manufacture of iron and steel. However, the design has been modified to accommodate high-quality coal, as well as coal powder and low qualities of coal available in the South. Without these design changes, the small plants would have become dependent on raw materials from the outside with increased production costs as a consequence. The rapid development of the petroleum industry is once more changing the raw material situation. A number of small-scale fertilizer plants located near refineries are now contemplating the switchover to petroleum feedstock.

The choice of raw material has consequences for the investment costs and production costs. It appears—in the absence of petroleum feedstock—that coke would give the lowest investment per ton of finished product. A plant producing 2,000 tons of ammonia or 8,000 tons of ammonium bicarbonate per year would require an investment of 295 yuan per ton of finished product if based on coke. The investment per ton would be 388 yuan if the production was based on brown coal. See table 5 for further information on raw material and fuel consumption, number of workers and production per worker in small-scale plants of different sizes and using different raw materials. This information is taken from a handbook on industrial planning, published in 1963 but mainly based on figures relating to the situation in early 1958.

TABLE 5.—PRODUCTION OF NITROGEN FERTILIZER (NH_4HCO_3) IN SMALL SCALE PLANTS

Raw material (type)	Amount	Annual production	Fuel consumption (coal) tons	Number of workers	Investment total million	Per ton	Per worker	Production per worker-tons
Coke (tons)	3,400	8,000	3,300	193	2.36	295	12,228	41
Coke (tons)	16,000	40,000	17,400	327	9.54	239	29,174	122
Brown coal (tons)	9,200	8,000	3,300	193	3.10	388	16,062	41
Brown coal (tons)	36,400	40,000	14,500	420	11.96	299	28,476	95
Coke oven gas (cubic meter per hour)	3,000	40,000	7,300	430	10.46	262	24,326	93
(Coke oven gas refrigerated cubic meter per hour)	6,000	40,000	4,400	400	10.46	262	26,150	100

Source: Site and transport planning for industrial enterprises, China's Industrial Publishing House (compiled by Peking Industrial Construction Planning Bureau, Ministry of Construction and Engineering), Peking, January 1936 (1st edition).

The Chinese planners quickly realized that the very small plants were uneconomic, even if all external benefits were considered, and are consequently not included in this handbook. The figures still show that the economies of scale are not unimportant for the larger plants. The investment figure drops from 295 yuan per ton for a plant producing 8,000 tons of ammonium bicarbonate to 239 yuan per ton for a plant producing 40,000 tons per year—if production is based on coke. The figures are 388 yuan and 299 yuan respectively if production is based on brown coal. Investment figures for process industry for plants sized with a ratio of 1:5 would in other countries usually differ much more than the Chinese figures given here. There are two possible, not mutually exclusive, explanations for this. First, the pricing of the equipment for plants of different sizes may have been done in such a way that the small plants are subsidized. Second, the engineering and construction enterprises may in the past have been less able than their counterparts in Japan, the United States, and Sweden to utilize the inherent economies of scale in process industry. Such a fact, if correct, would then clearly have helped to tilt the balance towards a choice of producing chemical fertilizer in relatively small plants.

The rather small differences in investment per ton of finished product for plants of different sizes are further evidenced in the manufacture of ammonium sulphate.[13] The figures show that the investment per ton drops from 360 yuan for a plant producing 7,600 tons to 235 yuan for a plant producing 210,000 tons per year. The ratio for investment costs per ton is 100:65. There can be no doubt that the ratio for process plants with a production capacity range of almost 1 to 30 would have been much greater in any other industrialized country. These figures relate to the early sixties and by necessity reflect the conditions of the industrial base which existed in China at the time. However, it may be safe to assume that China's capacity to manufacture large high-technology process plants in the early sixties and even later has been rather limited and that this continues to be at least

[13] Site and transport planning for industrial enterprises. China's Industrial Publishing House. (Compiled by Peking Industrial Construction Planning Bureau, Ministry of Construction and Engineering), Peking, January 1963 (first edition).

partly reflected in high prices for domestically manufactured process plants. It must be relevant to find out the relation between investment cost and production costs. Relatively little information is available, and fragmentary information from a small plant visited by the author on two occasions—in December 1971 and July 1973—has been used here as an illustration. The figures relate to a small plant with a designed capacity of approximately 12,000 tons of ammonium bicarbonate. Actual production was slightly less—11,000 tons in 1973. Ex factory price is 150 yuan per ton. Total coal consumption was reported to be 9,000 tons at a price of 25 yuan per ton. (Coal is supplied at a state unified price of 17 yuan plus transportation costs.) Electricity consumption has been estimated and costs calculated at the reported price of ¥0.09/kWh. Number of workers and average wage level were reported as well as tax and profit rates. These cost components cover 57.3 percent of total production costs calculated as production times ex factory price (equals transfer price). The remaining costs, which mainly cover depreciation and maintenance and most likely capital charges, amount to 42.7 percent, which equals 25 percent of a total investment cost of 2.8. Consequently, costs relating to the investment consist of almost one-half of total costs for the standard size small nitrogen fertilizer plants.

There are a number of economies of scale. First, the number of workers and employees increases much more slowly than the size of plant. See the earlier information in table 5. The thermal balance can more easily, at least in theory, be improved in large plants, thus lowering coal consumption. If investment costs per ton of finished product can be reduced, this also has an immediate impact on production costs. As argued earlier, pricing of equipment is such that production cost savings due to the size of plants are considerably less than would be in other industrialized countries.

TABLE 6.—ESTIMATED PRODUCTION COSTS IN SMALL-SCALE NITROGEN FERTILIZER PLANTS [1]

	Amount	Percent
1. Coal: 9,000 tons x yuan25.00	225,000	13.6
2. Electricity: 4,000,000 killowatthour x yuan0.09 installed capacity: ≈1,000 killowat	360,000	21.8
3. Wages: 285 x yuan45 plus 25 percent	160,000	9.7
4. Tax: 3 percent of yuan1,650,000	50,000	3.0
5. Profit: 8–10 percent of yuan1,650,000	150,000	9.0
Subtotal	945,000	57.3
Remaining costs: Depreciation; capital charges (?), maintenance (25 percent of 2,800,000)	705,000	42.7
Total production costs	1,650,000	100.0

[1] Example from Lin County, Honan Province: Installed capacity—3,000 tons of synthetic ammonia per year, 12,000 tons of ammonium bicarbonate; actual production—11,000 tons of ammonium bicarbonate; price—yuan150 per ton; production value—yuan1,650,000 per year; total investment—yuan2,800,000.

However, there can be no doubt that economies of scale play a role. For example, the plant for which production costs are exemplified in table 6, was, at the time of the author's last visit, scheduled to undergo an expansion, which would raise the annual production of ammonia from 3,000 tons to 5,000 tons and the designed production capacity for ammonium bicarbonate from 12,000 tons to 20,000 tons per year. Total investment costs for this expansion was reported to be approximately 700,000 yuan. Further, it was reported that production costs would be approximately 135 yuan per ton after the expansion, a reduction which appears to result from the reduced costs for depreciation, maintenance and capital charges. A still larger ammonium bicarbonate plant in Shanghai in 1971 reported a total investment cost of approximately 8 million yuan for a plant producing 60,000 tons of ammonium bicarbonate. The production costs were then around 90 yuan per ton. These figures clearly indicate that the economies of scale are more important for production costs than has been revealed by the industrial handbook figures of the early sixties.

Investment costs have important consequences for production costs which was shown earlier. How do the small plants compare with the imported ones in this respect? The average price for one of the 1,000-ton-a-day ammonia plants is $36.3 million. If this amount is converted into Chinese currency at the official rate of exchange and calculated per ton of nitrogen, the cost would be 322 yuan per ton. The corresponding cost for a 2,000-ton ammonia plant of the late fifties would be 1,740 yuan per ton and for a more recent, modified plant with the designed capacity of 5,000 tons of ammonia per year, 1,030 yuan per ton. It must be remembered that the cost recorded for the foreign plants does not include site construction and certain peripherals which are included in the domestic alternatives. Additional cost for the imported alternative may be estimated to be in the region of 80 percent, leading to a total investment cost of approximately 575 yuan per ton nitrogen, compared to 1,030 yuan per ton for the best small-scale alternative. With limited foreign exchange earnings this difference may have been compensated for through the existing plan prices.[14]

It must be noted that the plant equipment and technology now imported not only leads to considerably lower investment costs per ton of nitrogen (at an official rate of exchange) but also enables lower production costs through a drastically reduced consumption of electricity which has a high price in China. The uncertain factor is the cost of petroleum feedstock which in the past has been priced considerably higher than the equivalent amount of coal. If this price differential for raw material, reflecting raw material scarcity, is maintained, the costs for the finished product may differ less than expected.

TABLE 7.—COMPARISON OF INVESTMENT COSTS IN INDIGENOUS SMALL-SCALE AND IMPORTED LARGE-SCALE NITROGEN FERTILIZER PLANTS

	Plant production		Nitrogen		Investment		
Origin	Product	Amount	Content percent	Amount	Plant (million)	Total (People's yuan)	Investment per ton nitrogen (People's yuan)
Foreign	Urea	480,000	46	220,000	(1)		322 (excludes site constructions).
Chinese	NH_4HCO_3	8,000	17	1,360		2.36	1,740 (includes site construction).
Chinese	NH_4HCO_3	[2] 20,000	17	3,400		3.50	1,030 (includes site construction).

[1] $36,300,000 equal Yuan 70,800,000. According to an estimated average exchange rate of 1.95 RMB to U.S. $1.00 (June 1974).
[2] Modified.

This very tentative reasoning indicates that in the past, with limited foreign exchange reserves to buy foreign technology and very limited domestic capability to build large fertilizer plants at low costs, the small-scale fertilizer plants have been a good alternative in providing

[14] It should be pointed out here that we do not know the exchange rates used by planning agencies in order to decide plan prices for imported machinery, equipment, and complete plants. It has been assumed that the earlier prices for domestically manufactured plants are plan prices.

nitrogen fertilizer. Further, it is not likely that the small-scale fertilizer plants will be closed down in any larger numbers, as the fertilizer they produce is still needed. And it is even likely that a number of small plants will continue to be built in areas where favorable conditions exist.

For a final comparison it may be useful to look at the alternative of providing 3,000,000 tons of synthetic ammonia—in 1,000 small units with the alternative of manufacturing the same amount in 10 large imported or domestically fabricated plants. The small-scale alternative makes it possible to distribute the effects of industrialization much more widely through location of plants in almost half of the county capitals all over China. Distribution of the product can then be carried out by local means of transportation and no elaborate distribution network is required. Further, sources of technology are domestic, and equipment has been manufactured in province-level or lower-level enterprises. Consequently, this kind of expansion of nitrogen fertilizer production has required very small amounts of foreign currency. The small size of the plants and the relatively low investment sums involved have made it possible to encourage some of the communes which were to benefit from the supply of fertilizer to partly finance the plants through contributions from their accumulation funds. Employment considerations are also important. The small-scale alternative provides employment for approximately 250,000 people against roughly 2,000 in the large-plant-alternative. As a result, China has trained a large number of technicians and workers in relatively advanced industrial skills. This trained labor force is now an industrial asset in itself but is also an important force in changing the mentality in the rural areas where traditional attitudes have to be changed. Moreover, the large number of small plants has required the plants and the industrial bureaus concerned to build up a substantial foundation of organization skills which has relevance not only for fertilizer production but also for any other advanced economic and industrial activity.

An attempt to list the different characteristics for the two main alternatives in providing chemical fertilizer to agriculture in China is recorded in table 8.

TABLE 8.—DEVELOPMENT STRATEGY CHARACTERISTICS—NITROGEN CHEMICAL FERTILIZER

	Alternative 4	Alternative 2–3
Production volume (synthetic ammonia).	3,000,000 tons	3,000,000 tons.
Number of plants	1,000 units	10 units.
Production capacity (synthetic ammonia).	3,000 tons	300,000 tons.
Location	Small towns	Cities.
Distribution	Factory depot and horsecart	Distribution netowrk (railway and truck).
Technology source	Domestic	Foreign.
Engineering	Provincial	Foreign/national.
Foreign currency consequences	Low import	High import content.
Resource mobilization effect	Considerable	Negligible.
Construction period	Short (1 yr)	Long (several years).
Total employment (factory)	250,000	2,000.
Training:		
Technical skills	Significant	
Organization skills	Significant	
Relative production costs (ex factory).	Higher	
Capital/output ratio	Higher	

All positive factors mentioned above have to be weighed against the disadvantages of higher investment costs per unit of finished product and higher production costs. Available information indicate that the Chinese planners have made a good choice in the past. However, they have never argued that small-scale plants should be an aim in itself. It now appears that the conditions are changing and that the time has come to emphasize fertilizer production in units which are, in industrialized countries, calculated to be more economic. Nitrogen chemical fertilizer production thus provides an example of a sector where the two-leg policy has worked and where a new industrial strategy is gradually taking its place.

Cement

The annual production of cement is estimated to have more than doubled in the period 1965–73 and now stands at an estimated 38 million tons.[15] The share coming from small, rural plants has during the period increased from roughly 35 to 50 percent. See table 9.

TABLE 9.—ESTIMATED PRODUCTION IN SMALL CEMENT PLANTS IN CHINA[1]

Year end	Number of plants	County coverage (percent)	Total estimate (tons)	Small share (Percent)	Small share Total (tons)	Yearly small increase (Percent)	Yearly small increase Total (tons)
1958							
1959				14			
1960							
1961							
1965	200		^{6} 15.10		^{6} 5.10		
1969					^{6} 9.10		
1970			^{6} 25.10	40	^{6} 10.10	11	
1971	1,800	60	^{6} 29.10	44	^{6} 13.10	30	^{6} 3.10
1972	2,400	70	^{6} 35.10	48	^{6} 17.10	31	^{6} 4.10
1973	2,800	80	^{6} 38.10	50	^{6} 19.10	12	^{6} 2.10
1974							

[1] This information is based on figures and percentages which at various times have been published by Chinese news media but are somewhat ambiguous. The author's estimates which are discussed in his forthcoming monograph on rural industry are supported by research being carried out independently in Scandinavia. See Larsen, Kjeld: China's Regional Industry (in Danish), Forthcoming report, to be published by the Institute of Development Research, Copenhagen.

Three basically different technologies (dependent on size) are used for the sintering process which is the core process in the manufacture of cement: rotating horizontal kilns, vertical shaft kilns, and ground level chambers. Some of the characteristics of the different kiln types are given in table 10.

TABLE 10.—TYPES OF CEMENT PLANTS

Level	Plant size (tons per year)	Technology	Mode of operation
Nation/province	>150,000	Rotating kiln(s)	Continuous.
Region/county	10-000–50,000	Vertical kiln(s)	Do.
County	<15,000	Ground-level	Intermittent.
Commune	200–5,000	Vertical kiln	Do.

The development of the Chinese cement industry in recent years differs from the development of small-scale nitrogen chemical fertilizer in several important respects. The average size of nitrogen plants has

[15] See table 9.

increased considerably since 1965, while the average size of the small cement plants has decreased quite considerably. There are a number of reasons for this. First, the present economies of scale probably play a more important role in the manufacture of nitrogen fertilizer than in the manufacture of cement. Second, it is easier to control the quality of cement in a small primitive plant than in the manufacture of nitrogen fertilizer. Third, much of the investment for the very small cement plants has been accomplished with scrap and idle equipment with very low opportunity cost. The same approach is ruled out for chemical fertilizer plants. Having used such equipment, the total investment costs have been calculated in a different way and are consequently lower than they would have been if the needed equipment had been delivered from state-owned engineering enterprises supplying equipment at unified plan prices. Finally, it appears that localities (collective units at county level and communes) have been given a relatively free hand in setting up their small cement plants and that no strict national supervision like the one for small chemical fertilizer plants has been enforced. It should also be noted that most of the very small cement plants are probably owned by people's communes. They are run intermittently and serve only a small localized demand.

What are then the main reasons for the rapid proliferation of the small and very small cement plants which apparently still continues? Meeting a local demand with a production based on local resources may be important. However, it is likely that the training objective sometimes is more important than the objective of increasing production through setting up the numerous very small plants. First, large rural plants require already trained personnel when they start production. Such personnel can be trained in small and very small plants and later transferred to the bigger plants—still in rural areas. Second, the cement plants may be one of the categories of industrial enterprises where rural workers can be trained in industrial discipline and organization at low costs. Finally, it should not be ruled out that many of the very small plants should be seen as preinvestment studies in finding out if local resources and other conditions justify the setting up of production on a larger scale.

Nitrogen chemical fertilizer is produced with the sole objective of providing agriculture with more fertilizer inputs. This statement overlooks the fact that relatively small amounts of synthetic ammonia, which is the intermediate product, is being used for other industrial purposes. However, cement is used in rural areas as well as in cities. This characteristic may have influenced the proliferation of the small cement plants. The reasoning would then be as follows.

The rural demand for cement has in the past partly been met by deliveries from urban-based cement plants. As a consequence of increased self-sufficiency in rural areas, production in urban places which was previously allocated for rural consumption has now to a considerable degree been reallocated for urban projects. Consequently, the expansion of the rural cement plants have partly had the effect of making more cement available for urban projects without corresponding investments in the urban-based sector of the cement industry. Most of the small cement plants have been built by counties or people's communes which have raised funds, procured equipment locally, and trained technical personnel locally.

The industrial handbook referred to above also lists investment costs for cement plants of different sizes. The investment cost is reported to be 1.2 million yuan for a plant with designed annual production of 32,000 tons, which is the standard design for the small cement plants in the same way that the 3,000 tons of synthetic ammonia plant is the standard design for the small nitrogen fertilizer plant.[16] This gives an investment cost of 37.5 yuan per ton. The larger plants with rotating horizontal kilns give investment costs of 19.5 yuan and 17.6 yuan per ton for plants producing 492,000 and 709,000 tons per year respectively. See table 11 for further information. It should also be noted that the large plants usually produce cement of higher quality and that the product in the larger plants is likely to be of a more even quality.

What consequences do the different investment costs per ton of cement have on the costs of the finished product. The pricing of cement is dependent on what purpose it is used for. The ex factory price is around 70 yuan per ton when taxes and planned profits are included. If depreciation and maintenance charges and possible capital charges are calculated at 25 percent of the investment costs, this would then amount to 9.4 yuan per produced ton in the 32,000-ton plant and 4.4 yuan for the largest of the two mentioned plants using rotary kilns. There, are of course other economies of scale. The wage costs are becoming relatively less important with increasing plant size. Coal consumption per ton of cement does not differ significantly for plants of different sizes, and there is no reason to believe that electricity consumption would be significantly higher per ton of cement in a small plant compared with a big one.

It should be noted that investment costs per ton of cement differs much more widely between large and small plants than was the case for plants producing ammonium bicarbonate and ammonium sulfate. This fact should be seen as an indication that the Chinese engineering industry at an early stage was able to make use of the economies of scale inherent in the plant manufacture. An obvious explanation for this is that the production technology required for the manufacture of cement plant equipment is much simplier than nitrogen fertilizer plant equipment, even for relatively large plants.

TABLE 11.—PRODUCTION OF CEMENT IN PLANTS OF DIFFERENT SIZES

Type of kilns	Annual production	Number	Cement quality	Coal consumption: Total (tons)	Coal consumption: Per ton (kg.)	Employment	Investment total	Per ton	Per worker	Production per worker (tons)
Vertical	32,000	2	400	7.6	238	358	[6]¥1.2.10	37.5	3,350	89
Rotary	492,000	2	500	126.0	256	810	[6]¥9.6.10	19.5	11,850	607
Do	709,000	3	500	168.0	237	972	[6]¥12.5.10	17.6	12,860	729

Source: Site and transport planning for industrial enterprises; China's Industrial Publishing House (Compiled by Peking Industrial Construction Planning Bureau, Ministry of Construction and Engineering) Peking: Jan. 1963 (1st edition).

[16] Investment cost reported when visiting small cement plants in 1971 and 1973 indicate that costs for the 32,000 tons per year plant may be slightly lower than the figures quoted. Coal consumption per ton cement does not differ significantly for plants of different sizes.

When deciding location, size, and technology for the cement plants it appears that transportation costs are much more important than investment costs per ton of finished product. That is to say that economies of scale due to reduced investment costs per ton of cement for large centrally located plants rarely compensate for the increased transportation costs in comparison with widely distributed smaller plants. Production costs depend on the efficiency of the plants, and many of the small plants are initially much less efficient than the larger plants. However, because of lumpy character of the large plants, the demand may not immediately match the production capacity. A lowered utilization of capacity would then immediately lead to higher production costs.

Local manufacture of cement can, according to available reports, be achieved in a small plant of standard design with a capacity of 32,000 tons per year at approximately 40 yuan per ton. A substantial number of China's more than 2,000 counties have all the necessary raw materials for producing cement. And press reports from China now mention that small cement plants have been set up on 80 percent of all counties. There can be no doubt that the high transportation costs, in the absence of railways or waterways, has been a significant factor in the Chinese emphasis of local manufacture in relatively small plants where the plant capacity has been chosen in order to match the market requirements of a county or part of a county.

To understand this fully, it is necessary to look more deeply into the question of transportation costs. The transportation system is, compared with industrialized countries, underdeveloped in many parts of China. Railway transportation or cheap water transportation is not generally available. A majority of the more than 2,000 counties have to rely on small lorries, horsecarts, or still more primitive means of transportation. The relative transportation costs in the early 1960's in Hopei Province, where Peking is located, are given in table 12 below. The apparently high plan costs for transportation by lorry may reflect the use of small capacity vehicles, poor roads, and expensive maintenance.

TABLE 12.—TRANSPORTATION COSTS IN HOPEI PROVINCE

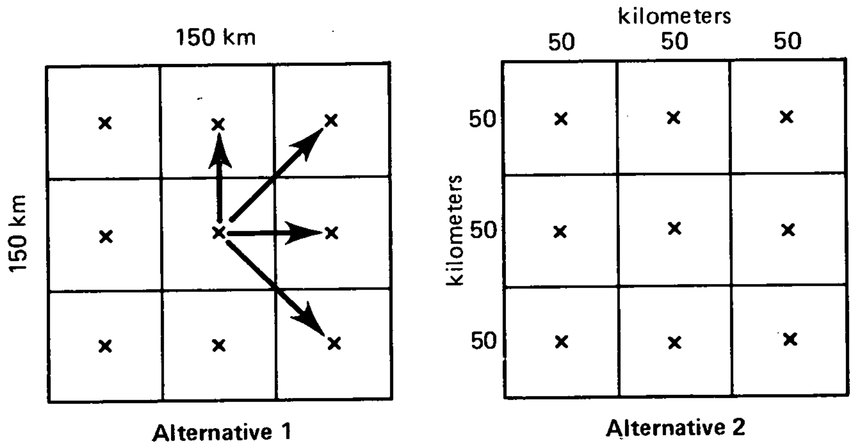
	Yuan per ton-kilometer	Rate
Railway	0.010	100 km cola.
	1.015	100 km pig iron.
	0.017	100 km cement.
	0.018	100 km steel.
	0.027	100 km steel products.
	0.045	100 km fertilizer.
Lorry	0.24	Flat rate.
Horsecart	0.41	11-15 km.

The influence of transportation costs can more easily be understood by looking at two different alternatives for meeting an assumed annual demand of 32,000 tons in each of nine counties. It might be assumed that an average region with nine counties would cover approximately 22,500 km². The general policy today is that each county—where raw materials are available—should have its own cement plant. The centralized alternative would be to build a rotary kiln plant producing 9×32,000 tons annually. To minimize transportation costs this would be located in the center of the region. See figure 2.

The average increased transportation distance (alternative 1 for sending cement to the county centers before redistribution would be:

$$\frac{4\times 50+4\times 70}{9}=53 \text{ km}$$

Figure 2. Alternative distribution patterns for the manufacture of cement—large-scale versus small-scale plants.



In the absence of cheap railway or waterway transportation the cement produced centrally should be manufactured at a cost which is at least: 53×¥0.24=¥12.70.

The cost is lower than for cement produced in the county centers if transportation takes place with lorries. If transportation is carried out with horsecarts the transportation cost of the central plant must be lower in order to compete with cement produced locally in the counties. This transportation cost must be at least: 53× ¥0.41=¥21.70.

It is likely that the cost difference between big rotary kilns and small vertical kilns is not sufficiently big for centrally located plants to be built for meeting the counties' need for cement, particularly when other factors favorable to the smaller local plants are also taken into consideration.

However, it should also be noted that cement produced in small local plants must be consumed locally if the above reasoning is to be correct. It further assumes that the influence of transportation of raw materials should be neutral. And it should be remembered that the quality in terms of strength of the locally produced cement is lower than cement produced in large rotary kilns. Furthermore, the quality of the locally produced cement is, on the whole, likely to be uneven. This leads to the conclusion that the localities will have to "import" cement of higher qualities for certain projects where the higher quality is required.

It is apparent that once a county center is reached by railway, the transportation costs no longer provide the same justification as before for building small local plants. However, the investment cost per ton of cement may still be lower than for big plants if idle equipment with low opportunity cost can be used. Aside from transportation considerations, the impact on employment and industrial training may have been considered to be very important in the regional context.

The scanty statistical information available indicates that the production of cement in small-scale plants in China has increased from roughly 5 million tons in 1965 to approximately 19 million tons in 1973. Consequently, the total increase in the small-scale sector amounts to 14 million tons. A small plant producing 20,000 tons per year employs around 200 persons. The total increase in industrial employment in small-scale cement plants would then correspondingly be at least 140,000 persons. A substantial number of rural plants are smaller and more labor-intensive than in the example cited here.

Thus, it can be safely assumed that the total direct employment effect from rural cement plants (manufacturing only) would amount to at least 250,000. This number is at least 10 times higher than employment in a small number of modern large-scale cement plants producing the same quantity of cement using a rotating kiln with an annual capacities in the range 150,000–600,000 tons.

There are other important labor force considerations aside from the employment effect. First, a large number of people are being trained in industrial process technology. Second, a sizable number of people have, inside production units, received training in organizational skills. A smaller but still sizable number have been trained in administrative skills related to the procurement of machinery and raw materials, distribution of products and coordination with other industrial units.

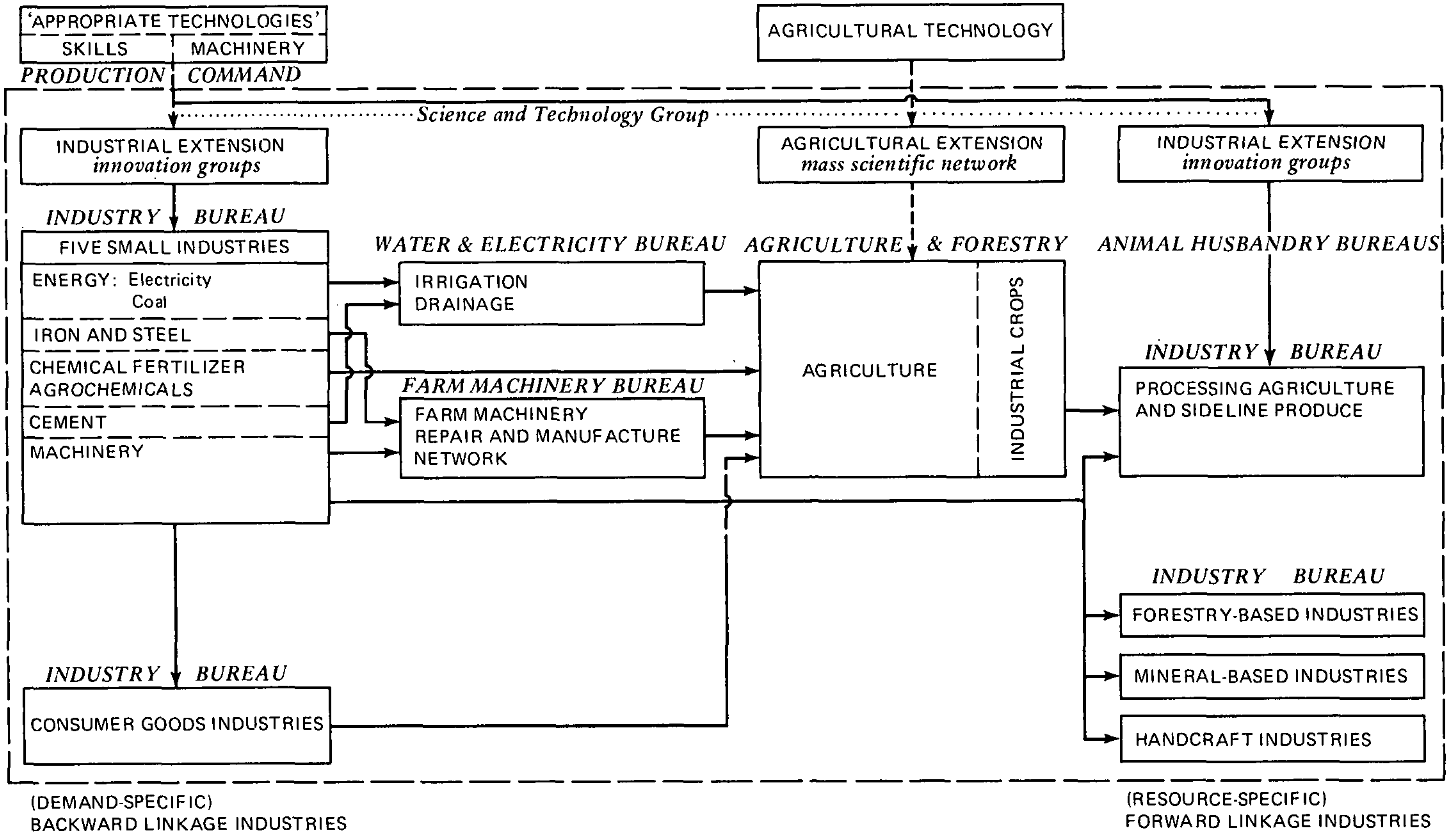
The Integrated Approach

Rural industrialization is not pursued as a policy in isolation. It should be seen as the outcome of a combination of strategies—for various industrial sectors on one hand and for integrated rural development on the other hand. Industrial sector strategies aimed at expanding the lower end of the spectrum can be nothing more than part of an overall policy to develop rural areas. The sector strategies usually cannot operate in isolation, as they are dependent on demand and resources which are influenced through rural development. However, the industrial sector strategies may lend a strong support to integrated rural development programs.

The development of rural industries is a function of both demand and availability of local resources, where it is generally easier to influence the former than the latter. Rural industry in China can be categorized as backward linkage industries meeting a demand for agricultural inputs, and consumer goods, and forward linkage industries being mainly based on locally available physical and human resources. See figure 3. The backward linkage industries, of coures, require local human resource but are initially very dependent on external technological and financial resources.

Rural industries with backward linkages to agriculture usually cannot be introduced until changes in agricultural technology create the demand for industrial input. Forward linkage industries are often dependent on supplies arising from increased agricultural production.

Figure 3. Model of a rural industrial system in China.



Furthermore, the demand for many industrial products will be limited until there is a general increase in the purchasing power of the locality. This is in most places—at least initially—almost totally dependent on increases in agricultural productivity. In sum, rural industrialization can progress only gradually and must be closely integrated with the overall planning of the localities.

Figure 3 illustrates the flow chart for a county or a locality which is well endowed with natural resources including coal, iron ore, and limestone. In such a locality the industrial activities can be divided into five different components. The first is the heavy small-scale industry which includes what the Chinese often term "five small industries". These supply energy, cement, chemical fertilizer, iron and steel, and machinery,[17] which directly or indirectly provide agriculture with the inputs which are necessary for raising the productivity. These plants are usually run by the county.

The second component is various resource-specific industries which may provide raw materials such as coal, iron ore, limestone, and other minerals to the "five small industries" or to larger national enterprises. It is evident that the resource base—location, size, and quality—decides to what extent small-scale industries can be set up. Economies of scale and the development of the transportation system are other important factors—as exemplified in the earlier section discussing local manufacture of nitrogen fertilizer and cement.

The third and fourth components of industrial activity in a county both belong to light industry. The main responsibility of this sector is to process agricultural and sideline produce and to provide the locality with some of the needed consumer goods. This may include flour milling, oil pressing, cotton ginning, et cetera, as well as manufacture of textiles and shoes, household goods of porcelain and metal, canned fruit, and so on. Light industrial enterprises are found at county, commune, and brigade levels.

The fifth component, the farm machinery repair and manufacture network, produces simple farm implements, tools, and also heavier equipment. Of primary importance is the repair and maintenance of farm implements and machinery in order to sustain a high rate of machinery utilization. Therefore, the repair and manufacture network has a three-tier structure where, in principle, each brigade and each commune within a county should have its own unit. Naturally, the smallest units are run by the brigades, medium-sized ones by the communes, and the relatively large units by the county. The goal is to develop a clear division of labor among units at different levels. The brigade units should engage in simple repairs and manufacturing. The commune units should be able to carry out more complex repairs and also manufacture heavier equipment. The county stations should be able to carry out the repairs of any complex for machinery being used within the county and also manufacture a substantial proportion of heavy equipment to be used in agriculture or in the units of the repair and manufacture network.

The Chinese planners have attempted to use the demand arising from a modernizing agriculture to create backward linkages—in a

[17] These and many others were the mainstay of the Great Leap Forward when China attempted to mobilize her abundant manpower resources and utilize local raw materials to simultaneously boost production in almost all industrial sectors.

rural context—for almost all of the important inputs required by agriculture.

Some of the backward linkage industries, such as cement and chemical fertilizer, are justified because of the existence of local raw material resources. However, their development has not been triggered because of existing local resources but because of a demand caused mainly by changes in agricultural technology, and they almost completely lack justification without local demand.

Mechanical inputs are manufactured in county-, commune-, and brigade-level units where the activity at brigade level usually consists only of a couple of blacksmiths using a few pieces of relatively simple machinery. Chemical inputs are usually produced in county-level enterprises even if mixing and simple phosphate fertilizer production may be found in commune-level enterprises. The manufacture of consumer goods is carried out at all three levels but more complex products (e.g., molding of plastic sandals) only in county-level units. Processing of agricultural and sideline produce is mainly carried out by brigades and communes. Forestry-based and mineral-based industry is generally carried out by brigades and communes, depending on the resource base, the manpower situation and the technology utilized. Handicraft industry is found at commune, brigade, and household level. All this relates to industry in rural areas proper, and the situation may be quite different in near-city locations.

Rural industries generally serve a small market, the size of which varies with the level—brigade, commune, county, or region—where the enterprise is found. Through choice of enterprise size and manufacturing technology it has been possible in many industrial sectors to transfer industry into rural areas and manufacture economically to meet a local demand, if all externalities are considered. Further, size of enterprise and technology is closely related to the control-initiative level and many localities—communes and counties—are already being drawn into subcontracting and manufacturing export items, thus also meeting an external demand. This is particularly true for rural industry in near-city locations.

It appears that the Chinese planners are now guided by a conviction that most of the facilities for economic and social activities in rural areas can be provided most effectively and economically when they are clustered in space so as to take advantage of interdependence in their functions and use.

To fully understand the financial implications of an integrated approach to agricultural development and rural industrialization, it may be advantageous once more to look at the diagram (figure 3), which shows the commodity flow between industrial components and agriculture. The figure also shows which economic units at county level control the various parts of the economic system. The county agricultural-industrial system should be seen as one functional organization with a number of subdivisions. All the different units must not necessarily operate with a surplus. The farm machinery repair and manufacture network usually operates with little or no surplus.

The command or control of the operations of the enterprises does not lie within the single units but is vested in the production command of the county (left top of the figure). Under its direct control are the various economic bureaus—industry bureau, farm machinery bureau, agriculture and forestry bureau, water and electricity bureau, et cetera. The overall productivity of the system depends, aside from capital accumulation, on technology improvements in agriculture and industry. So it is natural to find that both industrial and agricultural extension are under the science and technology group, which is a subgroup of the production command.

Concluding Remarks

The development of the lower end of the industrial spectrum in various sectors has made it possible to locate industries in rural areas—in near-city locations as well as in rural areas proper. The sector strategies are naturally undergoing constant changes due to changing internal and external conditions. Consequently, the lower end of the industrial spectrum is expanding rapidly in some sectors, while it is contracting in others, thus influencing the rural industrial system. Integrated rural development, on the other hand, includes rural industry only as one component of many instruments where improved public health, education, introduction, of agricultural technology all contribute to achieving policy objectives, such as increased gainful employment, increasing productivity and reducing differentials between urban and rural areas.

The justification of rural industrialization is economic as well as political. Economic growth may, however, in the short run have been sacrificed because of the need to transfer technical, financial, and planning resources to rural areas in order to start rural industrialization programs. In the long run, however, rural industrialization is likely to contribute to a more rapid economic growth than would otherwise have been possible. First, a decentralized pattern of urban development is likely to lead to a less capital-intensive expansion of industrial growth, which is better adapted to prevailing factor availabilities and relative factor prices. Second, if a majority of the rural population, through integrated rural development, might be persuaded to remain in villages and expanding county capitals, less investment for expanding large urban centers will be necessary. Third, rural industrialization provides the opportunity of simultaneously promoting agricultural and nonagricultural elements in the same local areas. Nonagricultural elements are just as dependent on a thriving increase in farm output and income as the latter are dependent on them. Fourth, a rural industrialization which has a strong core of local engineering enterprises is likely to play an important role in any decentralized industrialization policy.

An attempt is made to summarize the economic reasons into three main categories—to reduce short- and medium-term capital requirements, to incorporate the economy of many locations into the long-term planning, and to achieve resource mobilization.

The capital requirements are reduced in a number of ways. First, capital expenditures needed for housing and infrastructure are likely to be considerably lower in rural areas than in urban areas. Second, rural industries will in many cases reduce transportation costs, the high transportation costs being partly a reflection of capital scarcity affecting the transportation sector. Third, as almost all equipment and machinery in small plants can generally be produced within the country, the requirements for foreign exchange are reduced. Fourth, capital savings may also be achieved if the economic lifetime of "obsolete" equipment from plants in the modern industrial sector can be extended through use in small- and medium-sized enterprises. Fifth, local small-scale mining and other industrial activity can sometimes be carried out with lower capital per output ratio than in big units. Sixth, the shorter gestation period for a number of the small-scale plants also has an important bearing on capital requirements.

The development of small-scale industries is similarly of importance for long-term planning. First, industrial bases can be located and gradually developed where the potential demand is and where the raw materials are. Second, they enable a domestic engineering industry and design capability to gradually develop, which is likely to lead to a higher utilization of plant capacity in the machine-building sector than would otherwise have been possible. Third, skill formation takes place within local industrial systems and can first adapt to future local needs and later to the future needs of the modern industrial sector. Fourth, the industries become complementary and interrelated and can be used for large-scale subcontracting. And the system character facilitates the multipurpose utilization of human and physical capital which may reduce the influence of bottlenecks.

Resource mobilization is another important area where the system of small-scale industries play a role. First, the local character and extensive local control is likely to induce investment, particularly for commune- and brigade-level enterprises, and thus tap local savings arising from increased agricultural productivity which might otherwise have been consumed. Second, the existing wage differential between cities and countryside can be utilized, through subcontracting, in order to reduce cost and thus increase investible profits. Third, the lower average wage level in the rural industrial sector might be an important factor in controlling the rate of increase of the wage level in the modern industrial sector.

The principles of rural modernization and rural industrialization were spelled out early, but China had to carry out a considerable amount of experimentation in finding the appropriate forms of implementation. There has not always been a concensus on what the rural modernization and rural industrialization policies should be, and the Cultural Revolution which started in 1966 is, in many ways, a new starting point for more active rural policies which were first initiated in 1958. Although the principles of rural industrialization today are the same as or similar to those of the Great Leap Forward period, there are also distinct differences. This paper has almost exclusively dealt with the present stage of development of rural industries in China. However, one basic difference, which must not be forgotten, is that rural industrialization today does not aim at rapid transfers of manpower from agriculture to industry, which was the case in 1958. Many development economists have in recent years tended to assume that China is achieving considerable employment generation in the rural industrial sector. However, there is little evidence to support this notion, and there is nothing to indicate that Chinese planners are primarily aiming at this. Far more important is the objectve to achieve a complementarity between agriculture and rural industry.

Finally, the encouragement of efficient and productive small-scale industries in rural as well as urban areas has never been presented as an alternative to the development of medium- and large-scale enterprises. They have always been seen as a complementary element in the industrialization process. The experience of already developed countries suggests that a balanced industrial structure requires a considerable range of enterprises. The provision of a strong and viable development basis in China for small-scale industries is likely to have significant long-term economic as well as social advantages.

Part IV. DEFENSE ECONOMICS

THE UTILITY OF ALTERNATIVE STRATEGIC POSTURES TO THE PEOPLE'S REPUBLIC OF CHINA

By ANGUS M. FRASER*

Utility: The ability of a good or service to satify human wants. It is not an inherent property of things, but a relation between things and people, the relation being one of desire.

Encyclopedia Britannica, 1973.

I. INTRODUCTION

This essay centers on the military segment of national strategic posture in the People's Republic of China. While it is not an excursion into formal economic theory, it does seek to determine the adequacy of current and projected military forces in satisfying Chinese needs (as seen by the Chinese) and to look for feasible alternatives that might have greater utility. The massive internal functions of the People's Liberation Army enter only implicitly, in the form of an assumption that the leadership in Peking will not act consciously to alter or reduce the PLA's overall function as described by Mao Tse-tung: a work force, a propaganda force, and a fighting force.

Several basic assumptions and conditions underlying this essay are set forth in the next section. This is followed by a general discussion of the nature of war in the world today and a listing of major Chinese experiences in conflict since 1949. Forces in being and improvement plans are briefly described and related to operational capabilities, with some comment by U.S. defense officials. There is some consideration of several recent documents and an account of certain significant political-military changes that bear on posture decisions. Force characteristics and alternatives and the current condition and range of choices are then considered together to permit some tentative judgments about perceptions, goals, and preparations in the PRC, and the utility of alternatives to the existing strategic posture.

This paper rests, necessarily, on the professional judgments of the author. The nature of the approach, the limited availability of firm data, and the hypotheses tested all militate against detailed documentation. The professional judgments on Chinese strategic policy have been based on a review of the kinds of forces the PRC has developed and maintained and the use to which these forces have been put. From this assessment some central conclusions have been reached:

(1) A primary PRC objective has been adequate physical security. Current and future requirements are primarily to be prepared to meet substantial ground incursions from the Soviet Union and to avoid Vietnam-type destruction of their industrial and transportation systems.

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(2) A secondary strategic policy objective is that of reasserting territorial integrity over areas presumed to be integral parts of China such as the Paracel Islands, Taiwan, and other border areas. Controlled communication by military action on territorial issues characterized Chinese behavior in both Korea in 1950–53 and on the Indian border in 1962.

(3) A tertiary policy is that of extending Chinese power and influence. Currently the PRC views its neighbors not perceived as threats as more cushions or buffers than targets. In the long run the PRC would probably like to sit at the bargaining table as equals with the United States and the Soviet Union, but they appear to be patient and realistic about attaining this Asian and global power status.

II. Conditions and Assumptions

The attempt to assess the utility of alternative strategic postures faces the problem of dealing with two variables that are implied in the question, "utility for what?" One line of inquiry should pursue the comparative value of postures designed to serve an articulated and defined set of goals and purposes. If the purposes and goals are not clearly defined, the problem then expands to include an attempt to determine, from what is perceived, what goals are being served and whether some other posture might better provide the needed capabilities. This examination of Chinese posture is overarched by the question of affordability. What is the relationship between posture and cost? Does the situation reflect primary policy judgments over the types and numbers of forces that provide optimum support to national standards, or is the posture the result of compromises with the facts of economic life? Peking tells little that would encourage firm opinions about these matters, so this essay will, whenever possible, take both approaches.

The range of strategic postures to which a nation might aspire reaches from a passive, unarmed stance to one of massive global offensive power. What is chosen is usually a synthesis of the nation's ambitions or goals, its physical ability to produce the necessary numbers and types of weapons, and the effect that the resulting array is seen to have in the actual conduct of the nation's affairs. The question of utility enters into this consideration. It is required to describe the boundaries between sufficiency, or satiety, in certain types of capabilities and the transition to additional capabilities. While significant improvement in a pure defensive posture brings with it some increased offensive capabilities, there is a substantial difference between this phenomenon and deliberate choices that extend range and power well beyond defensive perimeters. In the Chinese case the choice of goals faces stringent limits imposed by a variety of attending circumstances.

The Chinese face the problem of deciding what useful results might accrue from expanding forces of the types now visible or, alternatively, from new levels of capability. It is difficult to envision any reduction in forces; Peking's stated conditions for entering into discussions of arms control or reduction make this approach unrealistic. The problem is centered in the costs and benefits that would come from the movement past the current position of uneasy deterrence of the superpowers to that of parity with them. If the Chinese recognize—and most surely they do—that armed conquest is no route to security and prosperity, then its concern must be with the maintenance of that shield behind which China must work out her massive other problems.

The nature of the impact of economic conditions and policies on military programs is particularly important. Recently the Director of the CIA appeared before the Joint Economic Committee of Congress.[1] Some interesting information on comparative procurement expenditures of the PRC, the United States, and the U.S.S.R. was furnished. For 1973 Chinese spending on procurement was estimated to be 27 percent of U.S. totals and slightly less than that figure as compared to the U.S.S.R. Allowing for inevitable errors in our determination of Peking's actual program content and difficulties in costing them, it is still inescapable that the PRC is not now engaged in trying to spend its way to military parity. The amount of money available for weapons procurement suggests that systems costs enter significantly into Chinese strategic thinking. These general assumptions about conditions in the PRC will govern this examination:

First, the PRC does not have goals which are undesirable or unattainable. There is a prevailing rationality that establishes gross limits, at least in the short term.[2]

Second, there is a central strategy that supports the total view of the world.

Third, despite the historical record of internal debate and competition in military affairs, the leadership is capable of addressing and isolating military problems in military terms. This does not imply unanimity and the role of generations, experience, service associations, and origins must be acknowledged. Nevertheless, the concern here is over results.

Fourth, the PLA will be capable of satisfactory performance of its traditional internal functions in tasks other than military training, manning and garrisoning, and fighting. The work and propaganda tasks prescribed by Chairman Mao will be fulfilled.

Finally, it is suggested that the PRC search for a strategic posture that best serves its perceptions of the world and desire for movement toward national goals will be shaped by these considerations and conditions:

1. The imminence and character of a threat to some Chinese interest.
2. Strategic and operational concepts that derive from experience and current perceptions, in a uniquely Chinese mix.
3. The state of China's military technology.
4. The availability of resources and the portion of them that the PLA might claim and receive.
5. Alternative ways (other than armed force) of dealing with a problem.
6. The risk involved in the perception by others of significant expansion in capabilities of the PLA.

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[1] William Colby, *Allocation of Resources in the Soviet Union and China*, hearing before Subcommittee on Priorities and Economy in Government of the Joint Economic Committee, 93d Cong., 2d sess., Apr. 12, 1974.

[2] Mao's injunction to "despise the enemy strategically and to respect him tactically" seems appropriate here.

In the real world of Chinese affairs, the most immediate and compelling condition is the confrontation with the Soviet Union. Before March 1969 there were frequent small border incidents, but the whole problem between the two nations (which had been growing all along) came to focus in the Ussuri River incident. This marked the beginning of military actions that, at least in the Chinese view, responded to a grave and imminent threat to national security.

In July 1974 a British newspaper [3] put the Soviet strength opposite the PRC at 49 divisions, 1,000 tanks, and over 2,000 military aircraft. Tactical missiles, in numbers unknown, have been reported by several sources. It is logical to think that the Soviet Union counts in its forces against the PRC as much of its strategic nuclear strength as could comfortably be diverted from its posture vis-a-vis the United States. The Chinese posture in the border areas will be discussed later to illustrate some aspects of their thought on strategic matters.

Although some observers believe that war is imminent, some 6 years have passed without large-scale outbreaks (although minor, well-controlled incidents persist). Since late 1973 there have been several Peking statements and reports from Western observers in Peking that the Chinese leadership sees the danger of war as decreasing. Nevertheless the Chinese people are still exhorted to vigilance and readiness. Whatever their true estimate may be, there is little to suggest that Peking will alter her strategic policies and military programs because of any visible softening of the Soviet Union or confidence in nonmilitary means in preserving the national security.

III. The People's Republic of China and War

In "A Study of War" [4] Quincy Wright sets out causes of war which he sees as operative in the nuclear age. He lists:

1. Reaction to a perceived threat;
2. Enthusiasm for ideals;
3. Frustration over unsatisfactory conditions attributed to a foreign scapegoat;
4. Belief in the utility of threats of war or of war itself as an instrument of independence, policy, prestige, or power; and
5. Conviction that military self-help is necessary to vindicate justice, law, and rights if peaceful negotiations prove ineffective.

In addition to these specifications, Wright further discusses certain general conditions that are unfavorable to peace. He includes:

1. The lag of procedures for peaceful adjustment behind technological and ideological change;
2. The inherent aggressiveness of particular rulers or states;
3. Traditional feuds between states;
4. Bipolarization of power through alliances;
5. Inherent difficulty of organizing peace;
6. Problems of maintaining a stable equilibrium of power in a system of collective security among rapidly changing political and military forces;

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[3] London Daily Telegraph, July 15, 1974.

[4] "A Study of War," 2d edition, by Quincy Wright. University of Chicago Press, Chicago and London, 1965.

7. New states that need to have hostile relations with outside powers in order to maintain interior stability; and

8. Problems of the sources of sanctions of international law.

Although Wright does not mention it, there is a working offset to hostile action in the form of deterrence as it is now conceived. The openended nature of war, once begun, is a new entry into the field of strategic thought. It operates in its special way on both "haves" and "have-nots." A cogent description of the basis of much of the PRC and military action has been made by Harold C. Hinton:[5]

> * * * the CPR treats threats to its security with greatest alertness and caution. This caution is not always of a passive kind, however. When the CPR thinks it sees a serious but local threat to a vital interest, for example to the safety of its border, it may respond with retaliatory or even preemptive violence on a scale commensurate with the threat. If, however, the threat is a generalized one involving serious danger to the survival of the CPR as a national entity under Communist control, and if the CPR sees no other way of avoiding disaster, it is prepared to compromise on any issue but that of survival itself.

Wright's list of causes of war and Hinton's analysis of the Chinese style will be the basis for later examination of Chinese posture and capabilities and assessment of the utility of that condition in the service of the goals and concerns of Peking.

It is necessary further to consider the Chinese Communist uses of military violence for comparison with the principles outlined above. The following list covers only those actions that have been taken since the Communist takeover in 1949, but it should be noted that the experience of the Civil War included the broadest possible range of style and magnitude in conventional operations. The battle for Huai Hai (November 1948–January 1949) involved half a million Communist troops.

The attack of Quemoy in 1949.
Capture of Hainan, April 1950.
Takeover in Tibet, 1950–51.
Korean War, 1950–53.
Taiwan Strait, 1954 and 1958.
War with India, 1962.
Continuing action with Soviet troops along the border.
Takeover of the Paracels, 1974.

In addition Peking has supported insurgent movements in nearby and distant nations, provided an impressive amount of military assistance, and provided training onsite or in China for a number of troops and leaders. This history would suggest that it would be misleading to accept the PRC's description of herself as "peace-loving." "Security loving" would be more accurate.

There is particular meaning in the recent adventure in the Paracel Islands. The PRC has steadfastly asserted its claim to both the Paracel and Spratley groups in the South China Sea, but took physical action only in January 1974. Communist land, sea, and air forces, in a small but apparently well-conceived and executed operation, took control of several of the more important locations in the Paracel group, capturing the South Vietnam garrison and one American adviser. Claims to the Spratleys have been reasserted, but no similar physical action has followed.

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[5] Communist China in World Politics by Harold C. Hinton, Houghton Mifflin Co., Boston, 1966.

Why did the PRC move in this way, at this time? The claim has existed for some time, but action obviously was withheld until circumstances were favorable. It must have been very clear to Peking that the United States would not intervene in a very small local conflict that might conceivably produce a confrontation with PRC combat forces. The Soviet Union would be even more reluctant to become involved, particularly since it has no active client claiming the territory. There has been some speculation over the reasons for and value of this conquest. There is of course the intangible factor of nationalistic and hegemonic pride. It has been suggested that the area may have large oil resources to which a claim should now be asserted. It is also possible that there are plans for use of the islands as a base for keeping track of Soviet naval forces in or transiting the area. Whatever the purpose, the incident is interesting to this examination because it demonstrated willingness to move and considerable skill in executing minor offensive actions at a range much greater than any undertaken by the PRC before. The Spratleys, at a distance of about 800 miles, are beyond the range of Chinese air support and may conveniently be left for later settlement. The net result of the affair is a demonstration that Peking is indeed willing to resort to force under conditions that favor success while not being likely to produce a reaction from the superpowers.

It is not always clear, perhaps, that the Chinese perception of a situation is one that would be shared by other nations or groups, but the key to understanding sought here asks for recognition of Wright's categories and the validity of the Hinton statement. The imperative of survival, not unique to China, also underlies such political actions as the move toward better accommodation with the United States, but the military component of the security structure is not being neglected, as will be demonstrated. Meantime, Peking is continuously willing to resort to violence when the risks are low and some national interest is involved.

IV. The People's Liberation Army—Position and Prospects

Some idea of strategic concepts may be gained from an examination of the physical nature of the forces developed to support them. The posture of the PLA today reflects a history of political and ideological debate and continuous compromises over such matters as the threat to the PRC at different times, appropriate tactics to deal with that threat, and the portion of national resources that could be allocated to defense. Political fortunes and power can shift much more rapidly than can force-building programs and the process of changing direction in the latter is much more complicated. The present state of the PLA and the general direction of efforts toward its improvement are useful guides to interpretation of the strategic posture sought by the government, but whether this represents voluntary choice or simple acceptance of real constraints is a question for later discussion. The immediate concern is the structure of the PLA in terms of numbers, armament, and deployments, and current programs that will have significant impact on that structure. Growth and change since the 1969 confrontation with the Soviet Union on the Ussuri River will help to assess the principles underlying Chinese strategic judgments.

Ground Forces

The PLA has something on the order of 3 to 3.5 million under arms, over 80 percent in the ground forces. There are now more than 120 infantry divisions, an increase of about 15 since 1971. Armored divisions have increased from 5 to 7 and cavalry from 3 to 4 in the same period. One authority says that airborne divisions have tripled in number and now total 6, although there is some doubt that these are anything more than "air transportable" units. There are 20 artillery divisions of all types—antiaircraft, antitank, and ground support. Forty railway engineer divisions, of the type that performed well in North Vietnam are on the rolls. Security and border guard troops and production and construction corps units are organized, armed, and trained as light infantry. Like the militia, these forces would be of substantial help in any protracted defense of the homeland.

Ground force armament in comparison with that of the United States and of U.S.S.R. as of January 1975 was recently given by the Chairman, Joint Chiefs of Staff, in this table:

	U.S.S.R.	United States	People's Republic of China
Medium tanks	40,000	9,000	8–9,000
APC and fighting vehicles	30–40,000	22,000	3–4,000
Artillery	15–20,000	6,000	15–16,000
Heavy mortars	5–10,000	3,000	5–6,000
Helicopters	2,000	9,000	500–1,000

With respect to quality and modernity, the consensus is that the PRC is significantly behind the United States and U.S.S.R. It is producing the T–59 tank (their version of the Soviet–54A), and a standardized family of towed artillery. The armored personnel carrier is home-designed and produced. The problem of estimating actual numbers of small weapons is formidable, but the Chairman noted "a large inventory of crew-served weapons, including particularly a native-designed 82 mm recoilless gun—and thousands of RPG–2/7 weapons." The last named is the Chinese version of the Soviet's reloadable 85 mm shoulder-fired grenade launcher and its sizable presence suggests that the PLA is aware of the growing movement toward light weapons that redress the advantage once held by the tank, and are acting to integrate this advantage into its massive manpower resource. What newer concepts of the "automated battlefield" will do to the PRC's thinking cannot yet be gauged.

The mobility of the ground forces has been improved by modest additions to the military truck fleet, but even more by substantial increases in rail and road networks and in the civilian truck numbers. It may be concluded that tactical and logistic mobility within the borders of the nation have been greatly improved while mobility outside those borders has been less substantially enhanced.

The deployment of ground units mirrors the intensity of concern over the several frontiers. This is apparent in the 4-year growth from 33 to 50 divisions in the important northeast areas while strengths in the eastern and southern areas have fluctuated only slightly. Other areas reflect some drawdowns but the general posture in areas other than the northeast has been stable. The actual location of Peking's troops there are a matter for some speculation. A British newspaper[6] suggests that first-line units are positioned at some distance from the actual border, with militia and second-line units filling the area. Their mission would be to slow and define the attack and then to operate in guerrilla style—a concept well in keeping with known Chinese doctrine.

The upgrading of the ground elements of the PLA is a process of slow, relatively modest improvement in standard weapons. These is little evidence of efforts to reach the technological and performance standards of American or Russian weapons; rather, the activity seems to focus on augmentation of the natural numerical and positional advantages that the PRC enjoys in its defensive posture. This holds across the whole range of ground equipment, including electronics and communications.

Naval Forces

The Chinese Communist naval force numbers less than a quarter of a million men, including an air arm that emphasizes participation in air defense rather than long-range patrol and combat duties. From time to time several divisions of marines are reported but the evidence suggests that a small number of regular army units receive amphibious training, a practice followed by several other nations. The most striking aspect of the navy is the apparent growth of the submarine force—from just over 30 in 1971 to almost 50 in 1975. These are Chinese-made versions of the *Romeo* and *Whisky* classes produced in the generation immediately after World War II by the Soviet Union. There is one *Golf* class boat, capable of firing missiles, but no weapon has yet appeared. Submarines are the focus of most outside interest. The present number is just about what the Nazis boasted at the beginning of World War II and clearly endow the PLA with some capability to harass or destroy shipping. Against this, however, is the apparent lack of sea-keeping training, the absence of logistic systems for sustained operation, the inevitable retribution that would be visited on home ports and facilities, and the inescapable fact that the submarines, however good they may be of their kind, are of the immediate post-WW II generation and they would face a current and much more effective array of antisubmarine measures in the hands of any major opponent.

The PLA navy boasts 18–20 destroyer and destroyer escort ships, including 4 modern 3,700-ton destroyers of home design and fitted with missiles as well as antisubmarine and antiaircraft weapons. There are growing numbers of fast guided missile boats and hydrofoil patrol craft designed and built in China. There are a number of aging amphibious craft and motorized junks, but there does not appear to be any significant program to enlarge or improve these forces.

Naval forces are deployed from three major bases spanning the Chinese coast. Their excursions and operations are limited and deployment patterns reinforce the idea of a primarily defensive navy.

Improvements in naval elements include the continued building of types now in hand, with emphasis on new destroyers and close-in patrol craft. The building of more submarines of present type continues and rumors persist that one to three nuclear-powered boats are

[6] Daily Telegraph, *op. cit.*

under construction, but nothing has been launched up until now. As noted above, the single missile-capable submarine still is without a weapon, although a solid-fuel device is anticipated. The PRC has constructed two new modern shipyards. The general thrust of the building effort in the navy suggests a long-term effort to replace older Soviet-furnished vessels with newer and improved types of what is primarily a close-in defensive force.

Air Forces

The Chairman, Joint Chiefs of Staff, puts the number of PRC tactical aircraft at "over 800" and growing slowly but steadily. The strategic home defense mission is handled by over 3,000 fighter aircraft in 1975. Tactical roles may be varied as appropriate to provide ground support if needed. The total fighter inventory includes some Mig-15, about 1,700 Mig-17, and at least 1,300 Mig–19, according to one authority. The number of Mig-21, never large, is estimated now to be about 50. In 1971 there appeared a home-designed and built fighter, the F–9. This is reported to be a daytime interceptor with a service ceiling of 50,000 feet and speed up to Mach 2. There may now be as many as 400 of these aircraft but there appear to be serious technological problems that have slowed production.

The bomber fleet contains a number of the aging IL–28 and perhaps as many as 100 TU–16.

It is noteworthy that some observers, including senior U.S. military officials, think that there has been an overall slowing in the production of weapons and most particularly of aircraft. The numbers above constitute, for the most part, the higher range of estimates.

There has been no detected effort to produce an ABM. SAM sites are limited in number, but sizable increases in cannon antiaircraft weapons have been noted. Air defense radar of home production are in service, but the Chairman, JCS, spoke of an "outmoded air defense system." A ballistic missile early warning system, giving 90 percent coverage against Soviet missiles, has been reported. The shortage of all-weather interceptors and limited number of SAM sites share in the total deficiency. There is little open information about aircraft deployments but experience of reactions to threats from many points around China's periphery demonstrates a capability to move air units quickly. The ability to conduct standard-type airborne operations is limited, but recent purchases of U.S., British, and Soviet transports would, in emergency, add significantly to "air-transportable" capabilities.

Improvement efforts in the PLA air force focus on development of an all-weather interceptor and improvements in the thin (but well organized) defense system. In the words of the Chairman, JCS, again "* * * for the near term at least, the PRC will rely on size, dispersal of industrial facilities, and a modest air defense program to be its basic defense against air attack." Although some observers have questioned the reality of the "dig tunnels deep, store grain everywhere" campaign, it does fit neatly into this concept of air defense.

Nuclear Forces

China's first nuclear test took place in October 1964 and there have been 14 more since that date, although one was never acknowledged by Peking. The most recent test took place in June 1974. There have been tower shots, drops from aircraft, at least one missile firing, and an underground explosion. Yields have ranged from 20 kilotons or less up to 3 megatons. There have been periods of concentrated missile firing and the presence of MRBM and IRBM is now generally agreed. ICBM, often heralded as imminent, still have not been tested, although one missile firing was described by U.S. officials as a "limited range" test of a long-range vehicle. In April 1970 and in March 1971 China placed small satellites in orbit.

The actual number of weapons now in hand is estimated to be something between 20 and 30 IRBM and some 50 MRBM. The MRBM is a single-stage, liquid-propellant, transportable weapon with a range of about 600 nautical miles. The IRBM is deployed in permanent sites and has a range of about 1,500 nautical miles. It too is single-stage, liquid propelled. The principal aircraft for nuclear delivery is the TU–16 (operating radius 1,500 nautical miles) of which the PRC has between 50 and 100. IL–28 bomber and F–9 fighter aircraft may also be capable of this task. Sea launched weapons have not appeared, nor is there much direct support for the idea that a "limited range" ICBM is near.

Peking does not discuss its nuclear weapons tactics or strategy except in political terms. It is declared that China will never be the first to use such weapons. Proliferation among less-advanced nations is said to be beneficial since it inhibits major power dominance. The PRC reiterates that it is ready to join in action to destroy all nuclear weapons or to declare "nuclear free" zones.

The future course of the nuclear weapons effort is uncertain. Available evidence suggests "more of the same" at a pace that China can afford and in pursuit of a substantial deterrent posture. An examination of the test program would suggest that China is holding on to a broad range of options.

The Militia

Dr. Harvey Nelsen [7] examines the "main force and regional force" separation in the PLA in specific terms of the Cultural Revolution and demonstrates the basic differences between the two types. Although Nelsen's account shows the eventual involvement of "main forces" in the Cultural Revolution, the fact that two different kinds of forces do indeed exist in China and are subject to separate concepts of employment and control enters into study of the total force posture.

Military Assistance

The PRC maintains military assistance programs which, when compared with those of the United States and the U.S.S.R., are modest indeed. These programs nevertheless are worth examination, since they express the general world view and sympathies of the donor. The PRC's overall strategic posture is to some degree enhanced by friendly powers using Chinese equipment in pursuit of goals which are acceptable or even helpful to Peking. The usefulness of such aid is enhanced by the relatively low risk of direct involvement and consequent attack.

From 1955 to 1973 Chinese military aid amounted to U.S. $6.6 billion. The principal beneficiaries over the years have been Albania, North Korea, North Vietnam, Pakistan, and Tanzania. Some assist-

[7] Harvey Nelsen "Military Forces in the Cultural Revolution" in China Quarterly, issue No. 51, July–September 1972.

ance has gone to a number of smaller nations in the Middle East, Africa, and Asia. In some cases material and training support have been given dissidents and insurgents such as the Palestine Liberation Organization and the Popular Front for the Liberation of the Occupied Arabian Gulf. The pattern of assistance comports with a strategic posture that includes keeping a prospective opponent offbalance or preoccupied with other tasks.

U.S. Views

In his Posture Statement for fiscal year 1975 the Chairman of the JCS expressed the American military view of the PRC's strategic posture:

> The strategic programs of the People's Republic of China by contrast/with the Soviet Union/are proceeding somewhat more slowly than estimated last year. We still expect the PRC to deploy, by the end of this decade, a small, but effective, ICBM force which will be capable of striking all of the Continental United States. PRC general purpose forces are being modernized, but also at a relatively slow rate when compared with those of the United States and the U.S.S.R. Nevertheless, the People's Republic of China is continuing to increase its overall military power.

Later in his statement Admiral Moorer said that the PRC, while making progress in nuclear forces, was still far behind. This general view of Peking's conventional forces also appears at several places in the text.

The Chairman's Posture Statement for fiscal year 1976 maintains the view that the U.S.S.R. continues to be the more serious threat to American interests in Asia. Accounts of Chinese inventories and programs support the idea of closely controlled improvement. What General Brown said of PRC nuclear programs is reflected throughout the statement in discussion of all Chinese forces: "There is a steady, almost painstaking quality about this relatively small, but carefully conceived, strategic program."

It is instructive to recall that in 1968 Secretary McNamara said that a modest ICBM force would exist in the mid-seventies. The unanswerable question is whether the program ran into difficulties or whether resources were diverted to progams that made the greatest contribution to an anti-Soviet posture.

In his previously cited appearance before a congressional committee in April of 1974, the Director of the CIA displayed a chart showing some significant changes in PRC spending for military equipment. There was, between 1971 and 1972, a drop of almost 20 percent followed by the beginning of a very small rise into 1973. This phenomenon is of tremendous importance and its exact meaning has been the material for much speculation. It has variously been seen as an unreal phenomenon, that either did not happen or was attributable to the "dig tunnels deep, store grain everywhere" campaign that had been completed. There are suggestions that there was a sharp political encounter over defense costs and that this outcome represents a victory for economizers. This may additionally be related to the question of satiety—can more weapons of current types at the margin contribute effectively to defense posture? In effect, the bids of other, nonmilitary programs had greater weight. One of the more plausible explanations draws from the general problems that the PRC is believed to face in upgrading technology. This interpretation relates particularly to the F–9 aircraft. It is surmised that problems of series production have made it impossible to spend funds allocated, or the problem of developing an effective engine has proved more difficult than anticipated. This last explanation is reinforced by the continuing attempt by Peking to buy a number of Rolls Royce Spey jet engines. It appears, as noted earlier, that the production of this aircraft has slowed significantly.

V. Recent Trends in Military Affairs

The pace and style of development in PRC armed forces and posture have, over the years, reflected the impact of both internal controversy and changing perceptions of the surrounding world. Without attempting to recite the long and complex history of these matters, consideration of some recent political-military events or conditions and their apparent significance as indicators of the leadership's assessment of utility would be useful.

Selected Official Documents

The campaign to repudiate Lin Piao and Confucius has included retrospective proof that Lin was not at all the strategic and tactical genius he had been thought to be. The Peking Review carried, in the consecutive issues of September 20 and 27, 1974 articles praising and describing the military talents of Mao Tse-tung. The first article, "Conscientiously Study Chairman Mao's Military Writings", is not devoted to military affairs so much as to the political and ideological virtues that inform the military writings of the Chairman. Two concepts of operations, that for the Liaohsing-Shenyang campaign and the one for Peiping-Tientsin, exemplify the struggle against Lin's "obstinate adherence to his Right opportunist line." There is scorn for those rules of conduct and attitudes that derive from Confucius and Mencius.

Mao, on the other hand, "elucidated in detail the laws of military science, the application of strategical and tactical principles and so forth in history, providing a Marxist guiding principle and a substantial basis for our study of different schools of military thinking and different military lines." The article does not enlighten on the specific content of current strategic thought in Peking, but it can be inferred, particularly when considered alongside the content of the article that followed, that the Chinese people are being reminded of the virtues of daring and confidence, and the efficacy of Maoist tactics.

The second of the two Peking Review September articles fits a successful campaign into the anti-Lin context by identifying Lin as the leader who pressed for more modest efforts and piecemeal actions thus, as is now claimed, indicating a bourgeois attitude and a lack of understanding of the spirit and skill of the Red Army. The article "A Splendid Strategic Plan" says that at this time the Nationalist strength was falling while on the Communist side "there was every possibility to provide a steady stream of manpower and materiel in support of the front." Apart from its political content, the writer describes some aspects of the actual tactical scheme and stresses Mao's purpose in deliberately withholding followup actions after previous encounters. The dominant idea was to isolate separate areas and then by concentration of superior force defeat or induce the surrender of the opposition. Lin Piao's proposal for an attack on a single city is derided as shortsighted and damaging to the larger concept. Lin did not dare, it is said, to seize nationwide victory.

At no point does the article mention the current situation. The military lesson, however, is there to be learned. The recurring Maoist slogan to despise the enemy strategically and respect him tactically is illustrated very clearly and it is not too difficult to project earlier experience and success into the suggestion that Soviet forces along the Sino-Soviet border could also be defeated or stopped by similar tactics.

In the issue of December 27 the Review included another article on a military subject—"Concentrate a Superior Force To Destroy the Enemy Forces One by One." Using dialectic techniques it reiterates classic Maoist ideas and extols the part that "People's War" plays. While there is actually nothing new, the article is interesting because of its selection of subject—proper tactics for defense—and its timing.

The New Year's Day editorial is one of the major cyclic documents in the PRC system. It appears in several authoritative journals and illuminates some of the principal goals and problems of the central leadership. The editorial for January 1, 1975, gives considerable attention to military matters. Military construction is one of the areas in which "greater, faster, better, and more economical results" are to be pursued.

Mao's principal military works are to be studied more deeply and the criticism of:

> * * * Lin Piao's bourgeois military line should be combined still more closely with the study of Chairman Mao's military thinking, the enhancement of preparedness against war and the strenthening of army building * * *.

By contrast the editorial of the year earlier, although it exhorted the army to greater virtue and diligence, directed most of its attention to political and economic matters, the triumphs of the Third World in struggles for progress, and the militant ideological party line.

In June 1974 Nationalist Chinese sources published a classified PLA document called "Education on Situation for Companies." It is attributed to the Propaganda Division, Political Department, of the Kunming Military Region. It was meant to serve as an instructors' guide for the indoctrination of all troops in the "campaign to criticize Lin Piao and rectify the style of work." Twenty-five hours were to be spent on this material in units from the division downward. This material gives every appearance of authenticity and it furnishes some suggestions of the military and strategic preoccupations of the leaders.

The SALT agreement is derided as a sham behind which the superpowers continue their nuclear arms race. The United States gets a share of the Chinese wrath, but the major part goes to the Soviet Union. The alleged nonuse of force by the U.S.S.R. is characterized as an even bigger lie. The Chinese vow never to play into Russian hands by forgoing their own nuclear programs.

As evidence of Soviet duplicity the second lesson provides a formidable list of the troops and weapons stationed to menace the PRC directly. The threat from that direction is more serious and more direct than that from the United States. The numbers of units and weapons which "posture(ing) * * * a large-scale war in China" are in the higher range as compared to estimates from other sources. The Soviet presence in the Indian Ocean is added proof of bad intentions. All this leads to the conviction that China dare not relax and that preparations against aggression must not flag.

The third lesson, while stressing and illustrating the wisdom of Chairman Mao in his recent international maneuverings, also notes that both the Soviets and Americans seek to use the military position of Japan for attacks against the mainland. This idea has been thwarted, but the military threat, it may be deduced, has not disappeared. Also in this lesson the troops are told that we "must not pin our hopes on a peaceful liberation of Taiwan," thus keeping open the possibility of having to fight for this goal.

In lesson four the PLA is praised for its political and ideological zeal and it is said "During the past year, military training and war preparations were extensively intensified." Specific note is made of a return to concentration on military tasks.

The final section of the manual goes directly to the economic situation in the country and says about defense industry:

> A fairly complete system of defense industries has now been established. Aircraft, tanks, and other equipment can be produced in quantity. Atomic bombs, hydrogen bombs, and satellites have also been made. Conventional weapons produced by our country are of considerable assistance in international revolutions.

The total content of these papers goes well beyond what has been cited here. The material quoted is intended to give some understanding of Peking's rationale for new patterns of relations, particularly with Japan and the United States, and a justification of the current state of relations with Moscow. There is also evidence of the pervasive effort to account for the fall of Lin. The material dealing with defense and preparedness also suggests strongly that the internal programs for informing and influencing the people are derived from real concern over the strategic situation and China's ability to deal with it.

The Fourth People's Congress in January 1975 and the new national Constitution it adopted do not reflect the same sorts of concern, but some positive measures were taken to affirm civilian control of the military. Chou En-lai used the occasion to address the economic system and programs for accelerated progress on a broad front. Thus could be taken as a reaffirmation of a determination to focus on industrial growth, with long-term and orderly programs controlling the action. Chou also said that war between the superpowers was inevitable, implying perhaps that China, in words of one of her ancient sayings could "sit on the mountain and watch the tigers fight."

The PLA and Some of Its Leaders

The armed forces, originally withheld from the Great Proletarian Cultural Revolution in 1966, found themselves inserted in that affair in January 1967, to "support the left." The end of the Revolution found soldiers in a dominant position throughout the nation. Economic, political, and military activities were run by Revolutionary Committees whose control and membership were determined by military officials. There followed a period in which there was much evidence of military control all across the nation. This was accompanied by evidence of increasing power and voice for the commanders of the 11 military regions. It was widely believed that a struggle for succession post-Mao was in progress and that the military held the key to success for any eventual victor. Lin Piao had been officially anointed as principal deputy and successor to the Chairman. Then, with no warning and, for a long time, no explanation, Lin Piao disappeared. At the same time the Chief of Staff of the PLA and several other top rank officials fell from sight. Only gradually and incompletely has the story emerged, but it is now revealed that Lin Piao was an arch-traitor and conspirator and that he died in a plane crash, fleeing after an unsuccessful attempt to assassinate Mao. The regional commanders, all necessarily associated with Lin (although in quite different manners) remained in office for a time.

In December 1973, Mao, without any warning, decided to move these officials. With less than a week's advance notice, and with permission to take along only a very small personal staff, eight of these commanders were shifted, in most cases in one-for-one exchanges. They were not disgraced nor publicly censured, but if control of regional forces provided a base for extraordinary political power, this move represented massive surgery. How much residual power they hold and what degree of mutual support remains is not known, but logic argues that their power to influence the center has diminished. This idea is reinforced by the fact that six of these men were also provincial party committee secretaries in their old posts but were not so appointed in the new ones.

Senior military men and political leaders who fell from favor are beginning to reappear. Yang Cheng-wu was purged from his post as Acting Chief of Staff in early 1968. His successor, Huang Yung-sheng disappeared about the same time as Lin and has not been heard from. Yang has recently reappeared as one of the deputies to the Chief of Staff. Teng Hsiao-ping, who fell from favor completely during the Cultural Revolution, has not only been rehabilitated; he continues to gain in function and in power as the principal deputy for the ailing Chou En-lai. Most recently he has been appointed Chief of Staff, the first time this post has gone to one without actual military command background.

One of the significant personal histories is that of Yeh Chien-ying. He is one of the original 10 marshals. He was one of the chief planners of the Long March as well as a participant. He has long been associated with efforts to modernize the PLA. In 1961, Yeh told a training conference that the shortcomings in weapons of longer range and greater lethality made it necessary for the PLA soldiers to be trained to engage the enemy at close quarters with rifle, grenade, and bayonet and thus to cancel his standoff fighting advantages. He went on to say, however, that great effort should go into the manufacture of "superweapons" and that air and naval forces should look at more sophisticated types of operation.

During the hiatus of Lin's absence Yeh, as Vice Chairman of the party's Military Affairs Commission, served as the senior military man on occasions when such representation was necessary. Yeh, now in his late 70's, has just been appointed Minister of Defense. If past associations and service indicate future performance, the combination of Teng and Yeh promises a course that will be marked by considerable unanimity at the top over the role of the PLA and how it should go about its work of modernization. Together, Chou's declarations about future economic plans and, the attitudes of the military leadership do not suggest a climate in which advocates of greatly increased military spending will prosper.

Summary

The views that emanate from official sources represent some reliance on the proven methods of Mao. His genius is being reaffirmed, in part because of the necessity to cleanse him of the taint left by Lin. The nation's enemies are active and dangerous and the equipping and training of the PLA must be continued. If action over borders is contemplated, the people and the army are not being prepared for it. The economic push is vital and even more effort will be given it. The rearrangement of senior officials and the nature of the two men now at the top promise a conservative and perhaps pragmatic approach to the problems of national defense. It is particularly significant that the central authorities are all experienced men whose views and histories have been demonstrably harmonious with Mao's and Chou's and who can be counted on not to make radical changes in course. They were involved in previous program decisions that produced the existing military stance. Their ideas about programs and structure are very likely to be conditioned by their personal commitment to the larger principles of Maoist ideology.

VI. Conclusions

Wright's specification of reasons for war, together with Hinton's insight into the Chinese response to threats to her territorial integrity, suggest that homeland defense is now the determinant of utility of strategic posture in the minds of the Chinese leadership. There is some included capability to operate in support of regaining Chinese territory, but this is secondary. The actual history of Peking's military actions since 1949 can generally be fitted into this pattern.[8] The outstanding questions then are first, how well does posture fit purpose; second, to what degree does posture fail to fit other purposes? If it emerges that there is effective correlation between the goals sought and the posture provided, then it may be asserted that the posture has utility under current concepts. An upward shift in goals would reopen the whole question of utility and require the preparation and financing of very large weapons programs and a complete reversal of the now-existing relation between the military budget and all other major national programs. This sort of action might conceivably be evoked by some massive change in perception of threat but its voluntary adoption as a desirable alternative posture would be wholly incompatible with the general thrust of Chinese economic and political movement today.

The PLA as a Fighting Entity

Few weapons are defensive in the absolute sense and a realistic defensive strategy includes the ability to attack or counterattack on occasion. Nevertheless, it is possible to look at a force structure and to

[8] This requires acceptance of Peking's stated reasons for entry into the Korean War—an explanation not universally accepted.

make useful statements about the meaning of emphasis on some categories of armaments and comparative neglect of others. On this basis it is suggested that the PLA is seen by the leadership in Peking as a force designed primarily for the active and widespread defense of the homeland. The attack capabilities that inhere in this condition conceivably would be usable in operations beyond the frontiers but there would be inhibitions and shortcomings that arise from the absence of certain weapons and equipment. In the Chinese case the inhibitions would be comparatively weak in attacks on single neighboring states but would become increasingly powerful if the attack tended to produce the entry of either of the superpowers. In the particular case of the Soviet Union, a PLA attempt to reach any distance beyond China would meet large and modern defense forces. The Soviets have pointed out to the Chinese that their concepts of how to fight a war derive from experience against World War II foes; the advent of modern weapons and techniques, including rockets, against which there is no defense, make the earlier experience meaningless.

In provoking either of the superpowers Peking cannot escape the implications of nuclear retaliation. The slowly growing weapons stockpile of the PRC might deter first use by the opponent, but first use by China would invite the destruction of the economic and industrial system that has been produced at such great cost and effort. For a variety of reasons the Chinese nuclear weapons resources cannot, over any reasonable future, reach the point where their preemptive use could neutralize the ability literally to destroy China in return.

The conventional ground forces, supported by militia and regional forces are positioned to fight under local control for extended periods. They would have a formidable ability to tie down and harass an invader. The mixture of modernized regular forces and less sophisticated units is a basic article of Mao's military doctrine and maximizes the assets for resisting an invader. Firepower is more than adequate. Tactical mobility within a context of static, regional defense would not be critically impaired, but the interregional shift of first-line divisions would require the maintenance of the road and rail networks under significant attack. The problems of resupply of ammunition and fuel can partially be solved by stockpiling but the comparative lack of alternate production facilitie[illegible]ld effect long-term endurance under heavy air attack.

Naval forces again are deployed to operate within specified geographical areas in close-in defense. There is no capability to undertake major surface action beyond coastal waters. The submarine force, while sizable and growing, also gives the appearance of concentration on defense and few appearances in more distant waters have been recorded. The navy's ability to move forces for amphibious assault are modest and do not seem to be growing at significant rate.

The PRC's air forces concentrate heavily on home defense. The aircraft themselves are a mix of obsolescent Russian-types and somewhat more moden home-designed models, but the latter may be the focus of some major technological and production problems. Some aircraft are dedicated to ground support, but there is no evidence of a system for expeditionary air operations. Radar SAM, and antiaircraft cannon are positioned to protect important military and civil facilities. The bomber fleet of the rapidly aging IL–28 and the TU–16 has no modern replacement in sight. The latter, in effect, has the capability to transport a 3-megaton nuclear device over ranges about the same as those of the current missile delivery systems. Transport for parachute units is modest, although recent expansion in the civil air fleet and the organization of units that are at least air-transportable should not be ignored. It is possible that this helps in solution of the problems of redeployment, reinforcement, and resupply that are associated with decentralized regional defense arrangements.

Considered together, the armed forces of the PRC tend strongly to be oriented on home defense with of course some accompanying physical ability to project over continuous lines of communication into neighboring areas. Such projection into territory held by or under guarantee by one of the superpowers would evoke a level of punishment that Peking could not contemplate except in the conviction that massive attack was inevitably imminent.

Alternatives

Putting aside cost and time factors for the moment, there are four alternative strategic postures to which Peking might direct her efforts. The general categories of action related to these are:

1. Reduce present forces to some substantial lesser level in numbers and combat capabilities.
2. Hold at the present level, making only those investments that maintain it.
3. Work toward qualitative improvement within the present structure, seeking primarily optimum performance in current posture.
4. Make the quantum move toward expanded capabilities in terms of range and firepower, with particular attention to the enhancement of offensive capabilities.

It is inconceivable that the basic Chinese view of the world and the traditions of Chinese statecraft would permit recourse to the first of these policies and it is included only to note that other nations—most conspicuously, Japan—are capable of entertaining this concept as an element in interior political dialog.

The second category approaches the present state of China's strategic posture. The key to this approach is the maintenance of "present level." If it can be accepted that the intent now is to display forces able to make the cost of attack on China forbiddingly high, then it is reasonable to say that current programs are directed to support actual fighting (or operating) efficiency in a basic homeland defense posture. Certain bonuses accrue, as has been pointed out, notably the ability to intimidate or attack smaller neighbors should great power support of them weaken.

The third platform may be seen to resemble its predecessor, but the separation here is in terms of closing the gap in sophisticated modern weaponry; high-performance air defense aircraft, able to operate on equal terms with the best of Soviet or U.S. weapons; radar and missile systems that can deal with saturation attacks; greater battlefield mobility and firepower; and improved seaward defense and patrol capability represent the sorts of improvements that might fit this approach.

The final category is the one that would produce effective parity with the superpowers and would involve new families of aircraft, heavier ships, and complete modernization of ground elements to include tactical nuclear weapons. Strategic nuclear weapons would of course have to be present in numbers and types that would afford all the options and weight of explosives available to Moscow and Washington.

Costing Chinese Programs

It is not rewarding to try to price Chinese military programs. Personnel costs, as compared to the United States are negligible. It has been asserted by one economist that military production in China is most efficient when compared to other functions. On the other hand the problems of getting into series production on newer and more complex items can create difficulties. The determination of how much is enough for support of the present posture—the problem of further additions at the margin—leads to the problem of deciding where and how the threshold into a new posture is to be crossed. What is the utility of small numbers of modern offensive systems in the face of the holdings of the United States and U.S.S.R.? A respectable entry into this area of military capability would require massive increases in the budget and preemption of some vital types of plant. Even though it cannot be precisely costed, such a move would involve critical reductions in other production sectors. In the United States there is now talk about capital ships whose cost nears $1 billion and fighter aircraft that run from $10 to $15 million each. The physical and budgetary implications for the PRC should she undertake to try for some position of credible and useful global power, would require major surgery in the programs now directed to broad front progress toward the goal announced by Chou En-lai; a national economy advancing in the front ranks of the world.

The Current Condition

There is obviously a lack of symmetry among China's view of her place in the world, her economic power, her political weight, and her military capability. Physical safety, while present, is tenuous and uncertain. If the PRC were to concentrate on closing the military gap, she would face the problem presented in Zeno's sixth paradox: Achilles, the swift runner, can never catch the tortoise because the tortoise started first. The basic concept, false in its original application, would apply here because the tortoise started far enough ahead.

In her present circumstances, the PRC must pay close attention to both the political and military components of her strategy. Political changes can come more quickly. The PLA of say, 10 years ago, is discernible in the PLA today. having undergone incremental improvement within functional constraints. On the other hand, who, 10 years ago, could confidently have predicted the detailed course of China's relations with the Soviet Union, Japan, and the United States? The relaxation in U.S. relations and withdrawal of U.S. forces from Vietnam have effectively reduced the immediacy of the military threat from that quarter. It may also have introduced a new element in Soviet thinking about the way to deal with Peking. The present condition, probably not completely satisfactory to Peking, may nevertheless represent the best position achievable in the real and objective circumstances. Most of all, China needs time.

How will China spend her time? Present indications are for concentration on improving the industrial base and general economic power of the nation, with only that level of attention to the desires of individuals necessary for stability. Although some may see a growing pragmatism in the policymaking of the leadership, it should not completely be forgotten that political or ideological stimuli can produce phenomena that were not anticipated by outsiders, particularly in the case of Mao Tse-tung. With this reservation, it is still possible to say that PRC is directing her energies to broad front economic growth while preserving the driving Maoist concepts of social and political order.

Within this framework the PLA will provide a defensive wall, behind which other programs may operate. To spend too much on the shield would cripple the operations it is supposed to protect. The linchpin of the concept is the reality of deterrence—the belief by others that the PRC can make the cost of attack on her too high for whatever benefits might result.

China may be seen as a nation in process, while her major rivals are not; rather, they have arrived at strategic positions from which Peking cannot eject them. The long-range goal may be an approach to parity that gives China access as an equal in the international dealings of world powers. The exact method for doing this involves some risk-taking. There is one view in the United States that the most rational course is the most dangerous for others. By foregoing massive military programs now, and addressing directly the tasks of building a solid modern industrial base, the Chinese will develop the ability to produce in future much larger and more modern military systems.

This would indeed be likely, and there is little that others can do about it. The emergence of such a position would add greatly to the complicated competition for military security that now characterizes the Soviet-U.S. relation. China has reached an intermediate plateau of security. It would appear that her future military plans are directed to some continuous growth, at rates that do not cripple the movement toward total goals.

China's Choices

The PRC's ambitious and impatient struggle for simultaneous progress on many fronts induces intense competition for chronically short resources. Military demands have sponsors and opponents within the armed forces as well as in the entire government system. More is known about the product or result of the struggle, represented by the realities of the PLA, than is known of the process of debate and compromise that produced it. The concern of this study has been directed to what the forces in being and planned say about the play of stimulus and response between military tasks and their performance. Forces mirror their foes.

If security and integrity of the national territory are the primary and irreplaceable goals then the utility of the PLA today is very high. Pragmatically, the forces have performed their mission. This has been done after the trauma of separation from the major source of supply represented by Moscow. The continuing costs of maintenance and improvement are bearable.

Some equipment of native design has encountered problems of design and technology, but efforts to meet the problems continue behind the shield of older systems still in service. Most importantly, the security of the homeland has rested upon tactics and strategies attributed to Chairman Mao, regardless of the zigs and zags introduced by lesser men. In this effort all the people have an honorable part. Physically, this situation embodies the second category of action described earlier in this section.

It is not implied that the PRC would not seek a better stance. R. & D. efforts and increasing ability to produce such modern weapons systems as the *Luta* class destroyer, *Romeo* class submarines and—in spite of difficulties—efforts to improve air defense, all indicate movement toward the third category. With the improved performance capabilities residing in the achievement of a more modern defensive force, the doubts that must now arise from the inadequacies of "what is" could largely be erased. This move is particularly important in nuclear weapons. There is some reassurance in the deterrent capacity now in hand, but the existence of an assured second strike capability would inspire much more confidence.

It is therefore concluded that the present strategic posture of the PRC provides the minimum necessary utility for the moment. Budget constraints and technological problems will shape but not halt armament programs. Conventional weapons of improved design will replace older models as the addition of older models at the margin becomes increasingly less desirable. In the nuclear field the immediate goal will be the continued production of weapons able to inflict higher levels of damage on the Soviet Union, India. and perhaps Korea, Taiwan, and Japan. The ability to strike the United States appears less urgent. The risk of war on more than one front will not alter production of weapons but will have strong influence on the way they figure in strategic plans.

THE CHINESE DEFENSE BURDEN, 1965–74

By SYDNEY H. JAMMES

INTRODUCTION

Over the past 10 years the leadership of the People's Republic of China has maintained an ambitious array of military programs which have used a substantial portion of China's economic resources. The purpose of this paper is to examine the magnitude and types of resources allocated to the defense effort and to assess the burden on the Chinese economy.

MILITARY PROGRAMS

China's military policy has called for large conventional forces and small but growing nuclear deterrent forces. The 3-million-man ground forces—the world's largest—have been equipped and trained mainly for the military environment of the 1940's and 1950's, although an increasing proportion is being armed with more modern weapons. The air force consists largely of obsolescent short-range fighters, while naval forces have been configured primarly for coastal defense. In short, China has deployed the type of conventional forces one would expect from a developing country with a large population and a largely agricultural economy. The conventional forces stress manpower and easily manufactured weaponry in lieu of more sophisticated armaments.

China has also developed nuclear weapons for delivery by bombers and by medium- and intermediate-range ballistic missiles capable of reaching most parts of Asia. Longer range land-based missiles as well as a submarine-launched ballistic missile are probably under development, while work continues on what is apparently China's first nuclear-powered attack submarine (probably armed with conventional torpedos). The development and manufacture of these weapons, while limited in number, testifies to the mastery by the People's Republic of much of the technology of a modern industrial nation.

ECONOMIC IMPACT OF DEFENSE

An appraisal of the impact of China's military effort on the economy over the past 10 years is best made by dividing the discussion into two parts—military personnel-related costs, and weapons-related costs.

Military Personnel-Related Costs

Military personnel-related costs consist primarily of outlays for pay, food, and clothing for the armed forces and the pay of civilian employees of the armed forces. Examination of alternative civilian uses of military manpower suggests that the impact of military personnel-related costs on the Chinese economy is slight. Only a fraction of each military age group—perhaps 1 youth in 10—is selected for the armed forces. The great majority are assigned to the ground forces (2- to 4-year term of service), with a small fraction going to the air force (3- to 5-year term) and the naval forces (4- to 6-year term).

The normal recruit is physically strong and loyal to the regime—the two main criteria for selection. He has had primary and, increasingly common, middle-school education and in the majority of cases has been toughened by life in a largely unmechanized countryside. Once in the military forces, he is subject to rigorous physical training and to training in a number of skills often of later use in the civilian economy—for example, truck driving, construction skills, and communication skills.

The soldier contributes to production while on active service. The armed forces produce perhaps as much as half of their own food supply, assist civilians in planting and harvesting, and participate in the building of public works such as roads, railroads, canals, and water conservation projects. Finally, the personal living standards of the military are frugal and involve a minimum of support from the nonmilitary sectors of the economy.

The "opportunity cost" of the use of manpower in the armed forces—that is, the output forgone as measured by the output of these men in their best alternative use—thus is seen to be quite small.[1] China has a plentitude of people in relation to land and capital plant and indeed finds it difficult to usefully employ the nine-tenths of the military-age males who are not inducted. Similarly, the employment of civilians by the armed forces is little burden, i.e., costs only a small amount in output given up elsewhere in the economy.

Weapons-Related Costs

Weapons-related costs impinge more directly and heavily on the economy. Resources consumed by the armed services for (a) investment in defense industries, (b) weapons R.D.T. & E. (research, development, test, and evaluation) (c) weapons procurement and operation, and (d) construction of military facilities are the same types of resources needed for growth in the civilian sector. While limitations of data prevent a precise weighing of this burden, estimates of direct costs for procurement and operation of military equipment, as shown in figure 1, provide an appreciation of how weapons-related costs have grown over the past decade.

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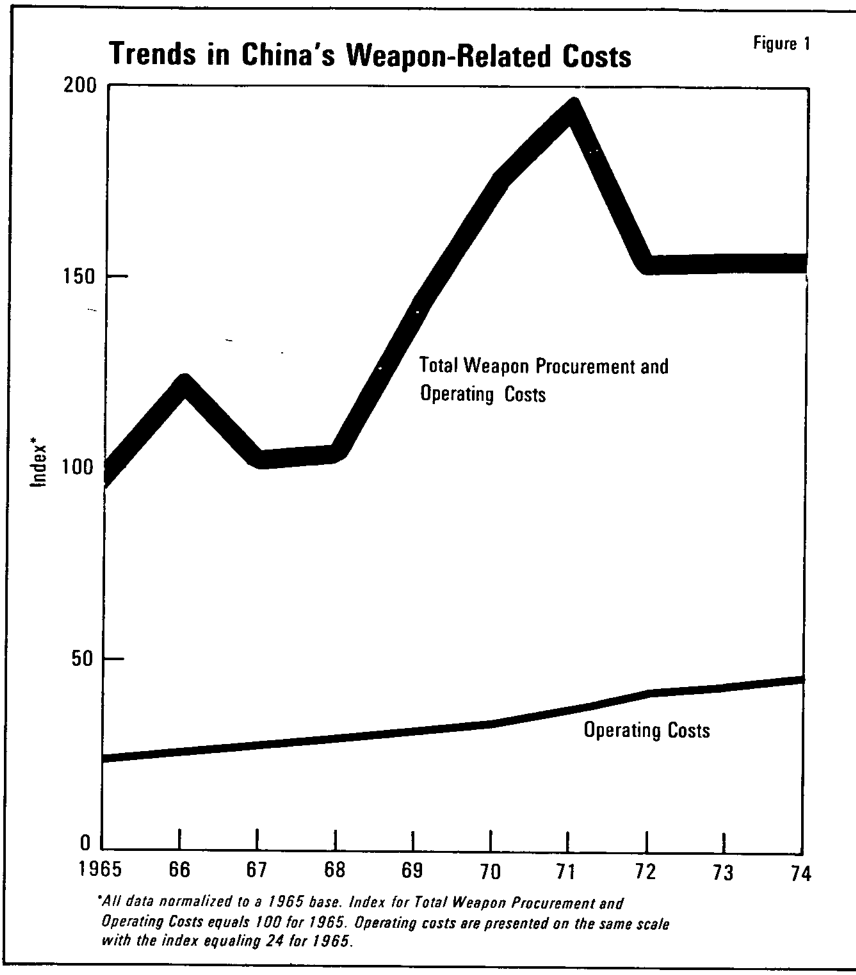
[1] A further exposition of this thesis can be found in J. G. Godaire, "Communist China's Defense Establishment: Some Economic Implications," *An Economic Profile of Mainland China*, Washington, Joint Economic Committee of the U.S. Congress, 1967.



The magnitude and trends of Chinese military equipment costs have been dominated by procurement costs. Weapons operating costs—consumption of fuel, spare parts, and miscellaneous materials—are estimated to be a growing but still small part of the weapons costs of the Chinese military forces. The Chinese are believed to maintain low inventories of spare parts and traditionally have operated their military equipment much less intensively than have the United States and the Soviet Union. Therefore, their operating expenditures for comparable equipment levels are much lower.[2]

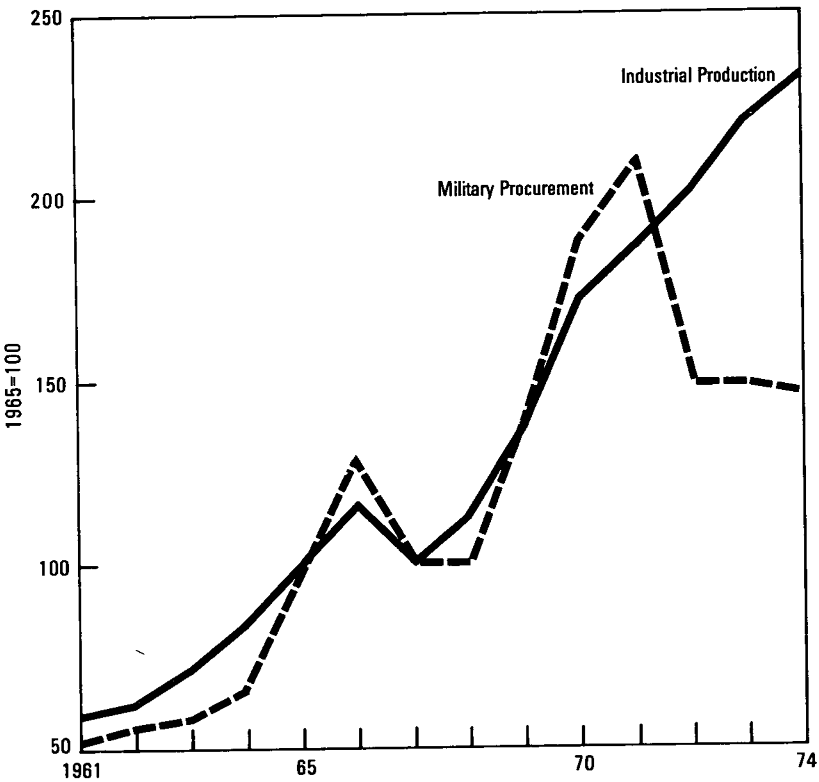
[2] Examples of the frugality in Chinese military operating practices can be found in Gerald H. Carr, *The Chinese Red Army*, Berkshire, United Kingdom, Osprey Publishing Ltd., 1974, p. 162; Edgar O'Ballance, *The Red Army of China*, London, Faber and Faber, 1962, p. 213; and Samuel B. Griffith, *The Chinese People's Liberation Army*, New York, McGraw Hill Book Co., 1967, p. 225.

Fluctuations in Procurement

Over the past 10 years, Chinese procurement of weapons has been characterized by a generally upward trend, with two periods of rapid growth—each followed by a decline, as shown in figure 2. The causes of these declines are discrete and distinguishable, that is, they do not represent a cyclical pattern.

Figure 2

Trends in China's Military Procurement and Industrial Production



Note: Because of methodological differences in the preparation of data for military procurement and industrial production, this chart should be treated as a general representation of trends and not as an exact comparison.

The first growth period occurred through the mid-1960's, as China recovered from the effects of the Great Leap Forward (1958–60) and the withdrawal of the Soviet military assistance (mid-1960). Arms production had practically stopped in the early 1960's, but by the middle of the decade the output of all types of weapons had reached new peaks.

In 1966, just when armament production seemed to have recovered completely from the Leap Forward, Mao launched his Great Proletarian Cultural Revolution (1966–69). The new upheaval affected military programs in a variety of ways, even though it was not basically economic in nature as the Leap had been.

The central authorities sought to insulate the defense industry from the disruptions of the Cultural Revolution. Nevertheless, political activity and factional conflict in the factories caused frequent disorders, occasionally of a prolonged and serious nature. Disruptions of the transportation and communication system led to delays in the delivery of raw materials, parts, and subassemblies.

A large number of leading Party and government officials were removed from office, with a resultant decline in policy initiatives. The curtailment in military production during the Cultural Revolution was not so severe or lengthy as during the Leap Forward. By the second half of 1968 the worst effects of the Cultural Revolution on the weapons industries were over, and another period of growth in defense production had commenced. Procurement appears to have risen rapidly in the following years, with output in 1971 being more than double output in 1967.

Since 1971, military procurement has fallen substantially. This drop has extended through 1974 and apparently is continuing in the first quarter of 1975. Production and procurement of military hardware in 1972–74 has been about 25 percent lower than during the peak period of 1970–71. Much of the decline reflects a sharp curtailment of acquisitions of aircraft, but other weapons production programs have also slowed down. The broad scope and long duration of the decline suggests that it is not simply the consequence of a coincidental cutback in several weapons programs; rather, it is the result of some general cause or causes.

Alternative Explanations of Current Decline

While the picture is not yet clear, several interrelated factors apparently are behind the decline in the production of weapons.

Because trends in weapons procurement correspond to the rise and fall of Lin Piao, political events surrounding Lin's abortive "coup" in the fall of 1971 possibly were a major factor in the decisions made in Peking. Official accounts of the coup state that military units were to have spearheaded the takeover, and it would not be surprising that the military establishment should suffer in the wake of Lin's aborted conspiracy.

China's political leadership has exhibited distrust of the military forces ever since the Lin incident. Shakeups in the military command structure have diluted the provincial civil authority of senior military leaders and may have reduced their influence on budget allocations as well. The background of this civilian-military tension lay in the Cultural Revolution when the military leaders moved—or were drawn—into the vacuum left by the fall from power of so many Party and government officials. Speeches and appointments at the Fourth National People's Congress of January 1975 may indicate that the process of restoring the more normal subordination of the military to the Party is nearly completed.

Disputes over economic priorities and budgetary allocations may in themselves have played a part in bringing the Lin crisis to a head, although direct evidence for this is thin. China's leaders may have decided that military programs were preempting an exorbitant amount of resources without significantly improving the country's military posture. Many of the weapons that China has been producing—such as the Mig–19 fighter—are fast becoming obsolete; additional numbers would not appreciably improve China's overall defense capability. Moreover, the Chinese policymaker must realize that the United States and the U.S.S.R. have an overwhelming superiority in both strategic and tactical arms and that even an allout production effort by the Chinese would not redress the military balance of power for many years to come.

At the same time, Peking probably feels that it now has sufficient nuclear and conventional forces both to deter the Soviet Union from attacking with nuclear weapons and to discourage the Soviet Union or any nation from attacking with conventional forces. Furthermore, in the minds of the Chinese leaders, the threat posed by the United States has decreased as well. Thus, Peking may reason that production of some kinds of military hardware should be cut back and the resources put to other uses—certainly until later models are ready for large-scale production. Such a reallocation would not mean a reduction in Chinese forces, but rather a slower rate of military modernization.

The leadership thus may believe that in the long run a strong economy would do more to strengthen China than would a bigger military buildup at this time. From 1965 to 1971, military procurement required an increasing share of Chinese industrial production and grew faster than overall industrial output, as shown in figure 2. Since 1971, the trend has been reversed.

The reverse side of this coin is the pressures put on the Chinese leadership to devote more resources to the strengthening of agriculture. In 1972, Peking began to contract for substantial numbers of modern Western industrial plants, a program highlighted by contracts for 13 large chemical fertilizer complexes. In 1972–73, the known value of industrial plants purchased abroad amounted to $1.2 billion. The erection and operation of these facilities will draw on many of the same scarce materials, equipment, and skills used in the defense industrial sector.

The decision to curtail defense production also may reflect decisions not to produce follow-on systems because of inadequacies in China's military research and development effort. The usefulness of weapons designs incorporating Soviet technology of the mid-1950's is nearing an end, and the development of modern weapons systems such as advanced fighter aircraft may be straining the current capabilities of Chinese technology. Problems in developing follow-on weapons systems almost certainly have contributed to the present slowdown of military production.

Some Aspects of Burden

A standard measure employed in the West to measure the burden of defense is to relate military spending to gross national product (GNP). A few years ago, the defense share of Chinese GNP, estimated according to Western concepts, was believed to be roughly 10 percent.[3] With the decline in military procurement and the continued growth in GNP, the percentage allocated to military purposes, whatever it was then, is appreciably lower now. Table 1 shows the approximate shares of GNP allocated to defense in several important countries.

Chinese planners, however, probably are more interested in what portion of the physical output of key machinery and industrial materials is absorbed by the defense effort. In particular, they must focus attention on the defense share of the output of the "metal processing industry." This sector not only supplies hardware to the military but also is the source of machinery and equipment for capital investment and for R.D.T. & E.—the two activities vital for modernization and growth. Finally, the sector supplies a small amount of consumer products.

Peking also must reckon with the escalating cost of developing, manufacturing, and deploying new generations of weapons. From their experience in developing missiles, the Chinese must have discovered what United States and Soviet planners learned long ago—each new generation of weapons becomes increasingly expensive to produce and operate. The advantage to the remainder of the economy in postponing large-scale production and deployment of, say, a missile system becomes greater and greater.

Outlook

Chinese defense spending in the next few years no doubt will be forced upward by the expansion of the land-based strategic missile force, deployment of a new sea-based ballistic missile system, and the introduction of new aircraft. Institutional forces inherent within the military and defense industries can be expected to actively support these programs.

The programs involve the use of technology at or beyond the frontier of China's industrial and technological capabilities. Large-scale production and deployment of these modern weapons will be at an increasingly high cost in terms of opportunities forgone in the remainder of the economy. The question is one of pace. Given that absolute defense expenditures will pick up, this does not necessarily mean an increase in the percent of GNP going to defense or a revocation of the new agricultural support program. The tight resource situation in the Chinese economy will continue to provide incentive for holding military spending down as the tasks of providing for a growing population and modernizing industry continue to mount.

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[3] Arthur G. Ashbrook, Jr., "China: Economic Policy and Economic Results, 1949–71," *People's Republic of China: An Economic Assessment*, Washington, Joint Economic Committee of the U.S. Congress, 1972, p. 45.

The present general ordering of military versus civilian priorities probably will persist through this decade even if Mao passes from the scene. The basic rationale for this ordering—the high cost and the technical difficulty of a more ambitious strategic weapons effort and the urgency of the claims of the agricultural and industrial sectors—will continue throughout this decade and beyond. The change in the nature of the military forces puts the emphasis on resources in which China is comparatively weak. The small burden of the former ground-based PLA is being replaced by the large burden of an evolving modern defense establishment.

TABLE 1.—*Estimated military spending as a percent of GNP, 1974*

Country:	*Percent*
Israel	48
China	(1)
United States	6
Soviet Union	6
United Kingdom	5
France	3
India	3
West Germany	3
Japan	1

1 Less than 10.

Source for countries other than China: *The Military Balance 1974–75*, London, The International Institute for Strategic Studies, pp. 78–79.

THE ECONOMIC CONSEQUENCES OF DEFENSE EXPENDITURE CHOICES IN CHINA

By ROBERT F. DERNBERGER

When the Chinese Communists swept into power and established the People's Republic of China at the end of the 1940's, their success was largely, but not solely, attributable to the field armies of the People's Liberation Army. The PLA had its origin (only two decades earlier) in the Communist guerrilla base areas and received its training in the Communist's struggle against both a militarily powerful foreign invader, the Japanese, and a better equipped domestic rival, the Nationalists, during the Second World War. As a result of their remarkable success against such overwhelming odds and their sincere dedication to serving "the people," members of the PLA have enjoyed a position of honor and respect as one of the most important elite groups in Chinese society and government today. The initial flush of victory in the Civil War did not, however, serve to resolve the monumental task of providing China with the defense prerequisites of a major world power.

At the end of the 1940's, the PLA consisted of a sizable force of capable, dedicated, well-disciplined, and mobile field armies, without any significant air or naval forces. Its domestic economic base was not only underdeveloped with a relatively small industrial sector, what industry did exist would have to be reconstructed merely to reestablish the relatively low prewar levels of production. Moreover, the PLA was still responsible for the continued conflict with the Nationalists who had fled to the island of Taiwan, less than 100 miles off the coast of the mainland, and would shortly enter the Korean conflict against the strongest military power in the world.

Despite this disadvantageous and inauspicious situation at the beginning of the period and the several ensuing internal political leadership crises which saw the demise of many of its most prominent leaders, only a superficial review of the history of the PRC is necessary in order to determine that the PRC today is a major world power with credible defense capabilities and has an economy which not only feeds and clothes one-fourth of the world's population but also is becoming a major industrial power as well.

Given the constraints presented by China's resource endowments, and present level of development, however, China's military potential and capabilities still derive from China's manpower resources. Thus, in terms of manpower alone, China's armed forces are on a par with those of the two major superpowers (the United States and the Soviet Union) and are slightly larger in size than the total armed forces in NATO.[1] In terms of modern armaments and supporting services, such

[1] Based on estimates of 3.5 million military personnel for the Soviet Union, 3.1 million for the PRC, and 3.1 million for the United States. The data used in this paragraph are from the statistical tables in the annual reports of the U.S. Arms Control and Disarmament Agency. The estimates for military manpower and expenditures in China are based on fragmentary data and are knowledgeable guesses at best. Nonetheless, they are sufficiently accurate for the purposes of the discussion in this paragraph.

as air and naval power, however, China ranks far behind the major superpowers with annual defense expenditures less than one-fifth those in the United States and the Soviet Union and less than one-half those in the NATO countries combined. In terms of annual defense expenditures per man in the armed forces, therefore, the comparison shows an even greater gap between China and the other superpowers.

This atypical mix of manpower as against modern, sophisticated weaponry, and air and naval power explains why China has been able to provide the third largest military force in the world, even though China is an underdeveloped country. In absolute and aggregate terms, China's economy is the seventh largest in the world, but its per capita income is still less than 200 U.S. dollars. The emphasis on a manpower intensive military in a labor abundant country such as China, therefore, has only served to keep within manageable limits the economic burden of China's recognized military capabilities. Given China's desire to equip its armed forces with some modern weapons and to provide a creditable military threat by means of carefully selected modern weapon systems, however, means that the economic burden of China's defense expenditures still claims a significant share of China's production—about one-tenth of China's total GNP. To put it in the popular terminology, China's emphasis on manpower in its military strategy has allowed the Chinese to obtain the biggest bang for their buck, but to obtain that bang they still have found it necessary to spend a significant share of the bucks they have available.

Attempts to evaluate the total burden of China's defense expenditures could conclude that the economic burden of these defense expenditures has been relatively small because they have not precluded the Chinese from obtaining considerable progress in their civilian economic development program. On the other hand, a similar study could conclude that this burden has been relatively large because the Chinese obviously could have achieved significantly higher rates of growth if they had devoted these expenditures to investments and output in other sectors.[2] Still other studies could seek to determine the economic burden of an attempt by China to create a military force comparable in size and composition to that possessed by the Soviet Union or the United States, concluding the economic burden of such a military strategy would be beyond China's present capabilities.

Attempts to estimate the economic burden of China's existing defense expenditures are important and useful in providing for a better understanding of the resource flows in China's economy and the economic consequences of the military policies and strategies China's leaders have adopted. Nonetheless, provision of a creditable military threat will continue to be a priority objective of China's leaders, no matter what the results of these studies would show, and the same would be true of any responsible leadership group of any country desiring to be a major power in today's world.

Our purpose in this paper, however, is not to analyze and estimate the absolute economic burden or consequences of any one particular, past or potential future level or pattern of defense expenditures in the PRC. Rather, taking China's present defense expenditures and their costs as given we proposed to determine the economic consequences of

[2] An attempt to evaluate the economic burden of China's recent defense expenditure patterns is the subject of another paper included in this volume, see Jammes, *supra*.

any changes in their present level and composition. These marginal changes in the level and composition of China's defense expenditures are the actual choices available to China's leaders in their determination of China's future military policies and strategy and the economic consequences of these various choices can be expected to play a significant role in determining the resulting choice that is made.[3]

The importance of the economic consequences of these various choices would hold true even if the economic burden of China's present defense expenditures were determined to be relatively small and manageable within the existing resource flows in China's economy. Any marginal change in China's present defense expenditures which called for either an increase in total expenditures or a greater share of those expenditures being devoted to the production of military hardware would have an economic cost of much larger proportions than is true of the absolute costs of China's present total defense expenditures, i.e., the marginal costs would be much larger than the average costs. On the margin, additional defense expenditures—especially those on military hardware—require the use of high priority inputs from other sectors where scarcities and imbalances already exist. For example, an increase in the level of defense expenditures or change in their composition in favor of more military hardware reduces the potential supply of producer's goods for civilian use, the demand for which is increasing rapidly; reduces the supply of exports and increases the demand for imports, although the Chinese balance of trade has required China to use its scarce holding of foreign exchange in recent years; and would reduce the potential standard of living of the civilian labor force which is already relatively low and the source of potential public discontent and opposition.

Thus, as China's leaders consider the various defense expenditure choices available, they obviously will be heavily influenced by the economic consequences of these choices. It is the purpose of this paper to draw up preliminary and tentative set of estimates for the relative magnitude of these economic consequences of the various defense expenditure choices involved.

Methodology

To obtain our estimates we do not propose to spell out in detail the various military expenditure choices the Chinese leaders will actually consider, let alone forecast the particular choice they are likely to make. That would involve an evaluation of what Chinese leaders will be making the choice, their objectives, and the international political situation they are likely to be confronted with, as well as the domestic economic consequences of the military expenditure choices available. Our purpose in this paper is much more limited and concentrates on the analysis of several readily definable defense expenditure patterns which are illustrative of the most clearcut choices available to China's leaders. Although the actual policies to be considered in the future undoubtedly will be a combination of various elements among the different alternatives selected for analysis in this paper the results obtained from our analysis will be indicative of the types of economic

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[3] The utility of the military strategy choices available to China's leaders also is the subject of another paper included in this volume, see Fraser, *supra*.

consequences and their relative magnitude for any particular mix of military expenditures which may be chosen.

A second qualification which must be emphasized at the outset is to repeat that our results are indicative or illustrative of the types and relative magnitudes for the economic consequences of China's military expenditure choices; they are not meant to be taken as the accurate or absolute point estimates of real costs which would be incurred were the Chinese to pursue the particular options studied. The lack of sufficient empirical data on a sector-by-sector basis, especially for the defense sector, precludes an attempt to obtain accurate estimates. Moreover, the methodology used to obtain our results, although it may appear to be somewhat sophisticated, is really rather crude and relies on too many simplifying assumptions to permit us to claim a high degree of accuracy for our results, even if the data base used were accurate. No matter, accurate estimates would really tell us little more than our crude estimates of relative magnitudes inasmuch as it is probably only a vague impression of these relative magnitudes for the economic consequences of these military expenditure alternatives, rather than specific cost-benefit calculations, which actually influence the Chinese leaders decisions.

Finally, as any observer of the Chinese experience over the past 25 years must know by now, the Chinese leaders do not passively accept the unexpected or expected, but underestimated, economic consequences of their policy decisions. Undesirable or unaccepted results of one policy soon generate new policies to ameliorate those results; the Chinese leadership has shown itself to be remarkably willing and able to experiment within the basic context of their ideological premises and innovate with considerable ingenuity to counter and eliminate the undesirable consequences of their policies. The estimates for the economic consequences of any particular military expenditure choice presented in this paper, however, are obtained by simply tracing the expected direct and indirect effects of that choice throughout the economy, without allowing for any corrective reaction on the part of China's leaders. In short, the undesirable economic consequences estimated for any military expenditure choice represent an overestimate in that they exclude from consideration the almost certain reaction to these consequences by China's leaders which would aim to prevent any undesirable consequences predicted from actually taking place.

Our estimates for the economic consequences of any particular military expenditure choice, therefore, are determined by analyzing the effects of that choice alone while holding all other economic and military policies unchanged. Our analysis would become terribly complicated, if not impossible, if we were to try and derive our estimates while continuously introducing new policies. Events in the real world, of course, do represent the two-directional interaction between observed results and policy formation, but we are forced to analyze that reality by means of a more simplified and tractable model in which the policy chosen is the initial cause and the ensuing changes in economic events is the effect. Nonetheless, the first approximation for determining an optimum policy mix is the prior knowledge of the economic consequences of each individual policy and the purpose of this paper is to estimate the economic consequences of a few alternatives in the area of military expenditure choices.

These estimates are obtained by using an econometric model of the Chinese economy which identifies 17 different economic activities in the economy and specifies the relative magnitude or structure of resource and commodity flows among these activities.[4]

This econometric model is little more than a simplified flowchart or blueprint of how given resources can be allocated to several major productive activities in the Chinese economy and how the resulting output of commodities and services can be allocated among their various end uses. Admittedly a great many simplifying assumptions must be made in the development of such a model. A less formal approach would also allow us to derive quantitative estimates for the relative costs of China's alternative military strategy policies, but only by making these same assumptions explicitly or; if we choose to ignore the problems of consistency and specificity altogether, by hidden implication. The use of an econometric model, on the other hand, enables us to obtain quantitative estimates for the relative costs of possible alternative military expenditures in China which are consistent with assumptions which must be made explicit, and will take into account at least the most important interactions among the various economic activities in the economy and their most important indirect effects. These benefits are of even greater significance when we are faced with the problem of limited quantitative economic data.[5]

To claim that the use of an econometric model allows us to obtain estimates for the relative costs of China's alternative military strategy policies on the basis of explicitly stated assumptions and methodology without presenting the reader with the model itself would be a neat trick of evasion. Unfortunately, however, limits of space do not permit a detailed discussion of the econometric model in this paper. What follows is a brief summary statement of the important operational features of the model; appendix 1 presenting the essential specifications of the model for those who are interested. To the latter group, I apologize for not being able to explain in greater detail the methodology used to obtain the estimates presented in this paper.

The model identifies the scarce resources to be considered (unskilled labor, skilled labor, and capital), determines the supply of these resources, specifies the quantitative relationship between inputs and outputs in each of the four production sectors (the aggregate, sectoral production functions in the agricultural, heavy industrial, light industrial, and defense industrial sectors), and specifies how the outputs of these sectors is allocated to their end use (consumption, foreign trade, and defense) or as inputs in other productive sectors.

The effect, therefore, of any given policy choice as to the allocation of resources and of the resulting output, on the rate of growth, struc-

[4] This econometric model of the Chinese economy is basically the same as the one I developed in an earlier study to estimate the past, present, and future real costs of defense expenditures in the People's Republic of China for a project sponsored by the U.S. Arms Control and Disarmament Agency. It is a significantly modified and simplified version of Shigeru Ishikawa's econometric model of mainland China's economy. The model used in this study has been used to simulate the actual course of events in the economy between 1953 and 1957, being able to come within 5 percent of the levels actually observed, i.e., as reported in the official statistics or as estimated by students of the Chinese economy. For the period after 1957, the model was able to replicate an economic boom, a crisis, and a period of restoration very similar to the picture revealed in the available information for the post-1957 period.

[5] Even with an econometric model of the Chinese economy, however, empirical economic data still must be used to obtain our estimates and the saying "garbage in-garbage out" could be used as a valid criterion of our estimates if the empirical economic data we use are judged to be "garbage." Nonetheless, the use of an econometric model to obtain our estimates does economize on the amount of empirical economic data which must be used and forces us to use that data in a consistent and explicitly specified manner to obtain our estimates.

ture of the economy, standard of living, balance of payments, and any other indicator of economic development or military capabilities can be directly estimated. In this paper, our estimates of the relative costs of various alternative military expenditure choices are obtained by determining the level of resources available and existing level of economic activity in the various sectors in the initial or base year (1975), projecting the future course of economic activity if there were no change in the present mix of economic and military expenditure policies, and comparing these results with those which would emerge under different military expenditure policies. The difference between the projected evolution of the economy under the present policies compared to its projected evolution under alternative military expenditure policies is the real cost to the economy of these alternative policies.

These real costs (or benefits) of the alternative policies, therefore, are measured by the extent to which they reduce (increase) the standard of living of the Chinese labor force; aggregate supply of consumer's goods, the rate of employment, and the rate of growth for the economy as a whole; the extent to which they change the structure of the economy as between civilian and defense production; and the extent to which there is a worsening (improvement) in China's balance of payments.[6] In brief, the real cost of any change in military expenditure policy is not measured by a particular amount of resources or commodities directly required to make that change possible; it is the net effect of this reallocation of resources and commodities upon all sectors of the economy and it is the ability of an econometric model to provide us with estimates for these net effects which is the strongest argument for the methodology used in this paper.

The Base Year: The Chinese Economy in 1975

Our analysis of the real costs of alternative military expenditure choices in the future must begin with a brief assessment of the state of the economy in the present. Obviously, as reflected in the other papers presented in this volume, the attempt to spell out the quantitative dimensions of economic activity in China today is not an easy task.[7] What follows, therefore, is a somewhat tenuous set of "guesstimates" which are made necessary by the methodology used in this paper. Nonetheless, these quantitative estimates are presented in the belief they do represent a reasonable picture of the Chinese economy today and are consistent with the limited evidence available. Unfortunately, the limits of time and space preclude any extended discussion of the means by which these estimates are derived or the necessary supporting documentation for why they are said to be reasonable. In any event, the latter judgment must be made by the reader. The method of their derivation, however, does require some explanation.

The reason why we must have a quantitative picture of the present level of economic activity in the Chinese economy, as well as those estimates for the possible evolution of the economy over the next few

[6] When an alternative military expenditure policy is introduced in the economy, that new policy will generate either an increased demand for or an increased supply of resources inasmuch as an increase (or reduction) in defense expenditures will be provided by (or allocated to) some other sector of the economy; the sector supplying or receiving these resources being determined by the policymakers. In this paper, the consumption or the foreign trade sectors are designated as the sector chosen to balance any inbalance in the overall supply and demand for resources in the economy.

[7] Actually, I have not been able to read the other papers included in this volume before preparing my own, but this conclusion is based on studies of China's contemporary economy which have been published in the past few years.

years, presented in the next section of the paper, is to provide us with a benchmark for estimating the real costs or economic consequences of an alternative military expenditure choice. To determine these economic consequences, we must have some idea of what would occur in the absence of any change in military expenditures. The initial attempt to derive this desired "benchmark" in the detail desired soon revealed that exercise would not only be extremely time-consuming, but also indicated the results of that effort itself would be little more than a weak set of intuitive conjectures.

Rather than devote a large amount of time to the derivation of a new set of conjectures concerning the present state and future course of economic activity in China, merely for the purpose of using these conjectures as a benchmark for the analysis in this paper, a complete and detailed set of quantitative estimates already is available for this purpose; those projections for the future course of economic development in China during the 1970's generated by the same econometric model used in this paper which were obtained in a study completed several years ago.[8] I do not mean to imply my earlier projections were accurate, only that the economy they describe is a reasonable facsimile of the Chinese economy today and, therefore, can be accepted as our "benchmark" for our analysis in this paper. Only the most important quantitative economic indicators given by the estimates are presented here.

In 1975, China's gross domestic product (GDP) is estimated as amounting to 196.6 billion current U.S. dollars [9] and, in constant prices, is growing at an annual rate of approximately 8.4 percent. Existing estimates for the early 1970's tend to agree that China's GDP in 1971 was approximately 125 billion current U.S. dollars,[10] consistent with

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[8] Robert F. Dernberger, "The Opportunity Costs of Defense Expenditures in Communist China," (mimeo) prepared for the U.S. Arms Control and Disarmament Agency and submitted in 1970. (ACDA/E-114 IV). The estimates appear in ch. VII, "The Projections." The particular set of projections adopted to depict the present state of the Chinese economy for our purposes in this study are those which were generated under the set of policy assumptions labeled "balanced growth" in the earlier study.

[9] This estimate of GNP is derived by starting with the model's estimate of net domestic material product (NDP) in 1952 yuan for 1975 and assuming the ratio of services to NDP is 25 percent, the rate of depreciation in the Chinese economy averages 6 percent, and the relevant exchange rate between 1952 Chinese ¥ and 1952 U.S. dollars is 2.34 ¥ per U.S. $1. This ratio of services (including transportation) to NDP is consistent with Perkins' estimate of 20 percent as the ratio of services (excluding transportation) to GNP. Dwight Perkins, "Growth and Changing Structure of China's Twentieth Century Economy" in Dwight Perkins, ed., *China's Modern Economy in Historical Perspective,* Stanford University Press, 1975. The resulting estimate of GDP in 1952 U.S. dollars is converted into current 1975 U.S. dollars by means of the implicit price deflator for U.S. GDP between 1952 and 1974.

[10] Citations are restricted to those sources which specifically estimate China's GDP and provide an explanation of how those estimates were obtained, i.e., these estimates are not intuitive guesses. Two estimates are available for China's GDP in 1970: Eckstein's estimate of 171.4 billion (1952) ¥ and the Liu-Yeh estimate of 152.8 billion (1952) ¥. Alexander Eckstein, "Economic Growth and Change in China: A Twenty-Year Perspective," *The China Quarterly,* April/June 1973, p. 232. Ta-chung Liu and Kung-chia Yeh, "Chinese and Other Asian Economies: A Quantitative Evaluation," *The American Economic Review,* May 1973, p. 218. When these 1952 ¥ totals are converted into U.S. 1952 totals at a rate of 2.34 ¥ per U.S. $1 and transformed into 1970 current U.S. dollar values by means of the implicit price deflator for U.S. GDP, we obtain estimates for China's GDP in 1970, in current U.S. dollars, of 113.1 and 100.8 billion U.S. dollars respectively. Three estimates are available for China's GDP in 1971; Ashbrook's estimate of 128.39 billion (1970) U.S. dollars, Rawski's estimate of 194.1 billion (1952) ¥, and Perkins' estimate of 193.36 billion (1957) ¥. Arthur G. Ashbrook, Jr., "China: Economic Policy and Economic Results, 1949–71," in *People's Republic of China: An Economic Assessment,* Joint Economic Committee, Congress of the United States, U.S. Government Printing Office, Washington, 1972, p. 47. Thomas Rawski, "Recent Trends in the Chinese Economy," *The China Quarterly,* January/March 1973, p. 21. Dwight Perkins, *op. cit.* (the estimate presented in the source by Rawski is for NDP and the estimate for GDP presented here assumes a depreciation rate of 6 percent). When these estimates are converted into U.S. dollars of various base year prices and transformed into 1971 current U.S. dollars by means of the implicit price deflator for U.S. GDP, we obtain estimates of 134.4, 134.3, and 120 billion (1971) U.S. dollars, respectively.

a GDP of 196.7 billion current U.S. dollars in 1975 if the growth rate, in current prices, were 12 percent a year or an annual growth rate, in constant prices, of 8.5 percent. By assumption, the service sector (including transportation) in our estimates accounts for 25 percent of GDP in 1975, compared to 27 percent estimated by Perkins (1971, in 1957 prices) and Liu-Yeh (1970, in 1952 prices).[11] Although the contribution of the industrial sector (38 percent) is larger than that of the agricultural sector (37 percent), our estimates do depict the Chinese economy as being slightly less industrialized with a somewhat more dominant agricultural sector than suggested by the estimates of others.[12]

The value of industrial output in 1975 is 74.7 billion current U.S. dollars and 21.8 percent of this total, or 16.3 billion current U.S. dollars, consists of military goods production. The size of China's armed forces is assumed to be approximately 3 million men and total defense expenditures are estimated to be 21 billion current U.S. dollars, or 10.6 percent of GDP.[13] No estimate is made for the rate of investment, but the net accumulation of new producers goods through domestic production and imports as a share of GDP in 1975 is 23.9 percent, which is almost identical to Perkins' estimate for 1970 of 23.8 percent.[14] The rate of investment in the economy would obviously be greater than the rate of accumulation of new producers goods, and although the estimated per capita GDP is approximately 246 current U.S. dollars in 1975, per capita personal consumption expenditures are estimated to be only 118.6 current U.S. dollars.[15]

Finally, in the foreign trade sector, the estimates were made with the assumption that China would maintain a balanced merchandise trade; imports being determined as the excess demand for producers goods necessary to achieve the desired level of investment and for agricultural products necessary to achieve the desired level of per capita

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[11] Dwight Perkins, *op. cit.*, and Ta-chung Liu and Kung-chia Yeh, *op. cit.*, p. 218. The service sector share of GDP estimated in the latter source is the residual share of the nonindustrial and nonagricultural sector. Perkins' estimate for the sectoral shares of GDP have been adjusted to make them comparable by transferring his estimate for transportation from the "manufacturing" sector to the "service" sector.

[12] Perkins' estimate for 1971 (in 1957 ¥ prices) are industry 42 percent and agriculture 31 percent; Liu Yeh estimates for 1970 (in 1952 ¥ prices) are industry 44 percent and agriculture 29 percent.

[13] According to the estimates of the U.S. Arms Control and Disarmament Agency, China's military manpower (including paramilitary) totaled 3.1 million in 1970 and total defense expenditures were 10 billion current U.S. dollars, or 8.3 percent of GDP. The Bureau of Economic Affairs, ACDA, *World Military Expenditures, 1971*, U.S. Government Printing Office, Washington, D.C., 1972, p. 12. In real terms, my estimates indicate an annual rate of increase of 11 percent a year between their estimates for 1970 and my estimates for 1975.

[14] Dwight Perkins, *op. cit.*, table B–1, appendix B. The reason no estimate is made for the rate of investment is that the accumulation of producers goods, which are the only capital inputs in the production functions in the econometric model used to generate these estimates, is the only investment activity included in the model, i.e., the services and monetary sectors are excluded.

[15] To obtain this estimate for per capita personal consumption expenditures, the econometric model estimates for the net value of light industrial and agricultural products distributed to the personal consumption sector are converted into market values and this total is assumed to represent 75 percent of total personal consumption expenditures. The total population in 1975 is assumed to be 800 million. While this estimate of per capita personal consumption expenditures, being only 48.2 percent of per capita GDP, may appear to be very low, it must be remembered per capita GDP also includes per capita investment and per capita government expenditures. For example, personal consumption expenditures for commodities in the United States in 1973 accounted for only 36 percent of GDP; when services are included, the personal consumption expenditures account for 62 percent of GDP. Thus, in China, where the service sector is much smaller relative to that in the United States, the rate of investment is much higher than in the United States, and government expenditures are approximately the same relative portion of GDP, the per capita personal consumption expenditures estimate for China presented in the text, while obviously subject to a considerable margin of error, would appear to be a reasonable approximation.

consumption, with exports determined by the level of imports. China actually incurred a small import surplus of 80 million U.S. dollars in 1973 and a much larger import surplus of approximately 1 billion U.S. dollars in 1974. At the time of preparing this paper (February 1975), it is difficult to determine whether or not these recent deficits in the balance of trade are a short-run temporary phenomena due to large-scale agricultural product imports resulting from domestic shortages, with the expected return soon to a basic strategy of overall balance in total merchandise trade, or the initial stages of a long-run strategy, implying the need to acquire large-scale and long-term borrowing from abroad. In any event, our estimates for 1975 were made several years ago and assumed a strategy of overall balance in total merchandise trade. Even with this assumption, however, our estimates for China's foreign trade sector are fairly consistent with recent developments; a level of exports and imports of approximately 6.5 billion current U.S. dollars, with imports of agricultural products accounting for 39 percent of total imports.[16]

Obviously, this summary statistical picture of the Chinese economy in 1975 is based on estimates with a wide margin of possible error, as is true of the estimate of others cited to support our own. Nonetheless, these estimates do appear to present a reasonable benchmark in our analysis of the real costs of alternative military expenditure choices in the future. They only provide us with a benchmark for the base year, however, and we also need a benchmark projection of the evolution of the Chinese economy over the next few years, assuming there were to be no change in existing military expenditure policy, in order to estimate the real costs of any alternative policy.

"Benchmark" Projections: Chinese Economic Growth, 1975–80 [17]

The reason for calling these projections our "benchmark" projections is to emphasize an important distinction between the projections presented here and a prediction of what will probably occur over the next 5 years in the Chinese economy. The latter type of estimates would require us to specify in detail not only the probable changes in resource availability and input-output relationships in China's economy over the next 5 years, but the probable changes in development and military strategy policies as well. Our purpose here is to estimate the relevant real cost considerations influencing the Chinese decision-makers in making policy choices in the area of military strategy, not in predicting which policy option they will actually choose. To obtain these estimates we merely "predict" what may happen if one particular policy-mix were adopted, termed the "balanced growth" policy for

[16] China's total foreign trade was approximately 5 billion current U.S. dollars each way in 1973, with foodstuffs accounting for 20 percent of total imports. *People's Republic of China: International Trade Handbook,* DOCEX Project, Exchange and Gift Division, Library of Congress, September 1974. Preliminary trade returns for 1974 indicate significant increases in imports of foodstuffs, total imports, and total exports.

[17] The next 5 years is selected as the relevant period for comparing the relative economic consequences of various alternative military expenditure choices for two reasons. The short-run effects of these various choices are undoubtedly of greater concern to the decisionmakers than the long-run effects, i.e., any serious problems occurring in the short run as a result of a policy choice would undoubtedly induce a change in that policy. Moreover, the methodology used in this paper to estimate the economic consequences of an alternative policy choice is essentially only meaningful for the short run, i.e., the fixed parameters used to obtain the estimates can only be assumed to remain relatively fixed in the near future.

purposes of identification and comparison, and project what may happen if the Chinese decided to adopt an alternative policy-mix. This distinction between our "benchmark" projections and a forecast of probable future events should be kept in the mind in the following discussion.

The meaning of the policy-mix referred to as a "balanced growth" policy simply means the Chinese decisionmakers select those policy choices available to them so there is no excess demand for resources. In terms of the model used to estimate our "benchmark" projections, an excess demand for resources show up as an import surplus which would require foreign borrowing or a decline in per capita consumption expenditures to provide for the exports required to finance the demand for imports. Thus, the major constraint on the policy choices would be the need to balance merchandise trade in foreign trade and no reduction in the current level of per capita consumption expenditures. Within these two constraints, the decisionmakers are able to choose a rate of increase in the level of investment; the allocation of investment to the various sectors of the economy, and the wage rates of the industrial labor force in their attempt to maximize the rate of growth.[18]

By means of trial and error, or iteration in the language of econometricians, the "optimum" policy choices meeting the requirements of a "balanced growth" development policy were determined.[19] The annual rate of increase in the level of investment is 15 percent; 20 percent of total investment being allocated to the military goods sector and to the consumer's goods sector, 30 percent being allocated to the producer's goods sector and to the agricultural sector. The average annual wage of unskilled labor in the consumer's goods industries is set at 170 current U.S. dollars per year; the average wage of unskilled labor in the producer's goods industries is 20 percent higher. The average annual wage of skilled labor in the industrial sector as a whole is set at double the level of average wages for unskilled labor in the producer's goods industry.[20] Assuming no exogenous shocks, such as a severe crop failure due to weather conditions beyond the control of the decisionmakers, or internal upheavals, such as the death of Mao and an ensuing crisis of leadership, these policy decisions concerning the rate of increase in investment and its allocation and the level of wages (consumption) of the urban labor force for the next 5 years could yield the following results.

The average annual rate of growth would be 8.8 percent; China's GDP in 1980 reaching a level of 300 billion (1975) U.S. dollars. The service sector, by assumption, retains its 25-percent share of total

[18] An additional side constraint concerning a desired rate of increase in military expenditures could be specified as a necessary condition for the "balanced growth" development policy. Inasmuch as the assumption of a constant level of military manpower is made in our estimates of the "benchmark" projections for the "balanced growth" development policy, however, the rate of increase in military expenditures is determined by the policymakers' choice of the share of total investment allocated to the defense industries. Thus, rather than being included as a constraint on the decisionmakers, the rate of increase in military expenditures is implicitly included as one of their policy choices within the two major constraints of a balanced merchandise trade and no decline in the level of per capita consumption expenditures.

[19] The values for the technical parameters in the model (the rate of growth of resource supplies and the input-output relationships) used in obtaining the "benchmark" projections for a "balanced growth" development policy were the same as those used in estimating the statistical picture for the economy in 1975, presented in the previous section of this paper.

[20] Although we have been careful (due to lack of space and available data) to eliminate the need to empirically justify the relevance of these particular policy choices to current developments in the Chinese economy, I believe this could be done on the basis of the limited empirical information that is available.

GDP, but industry increases its share from 38 to 40 percent between 1975 and 1980, while agriculture's share declines from 37 to 35 percent. Thus, the volume of industrial output in 1980 is 120.6 billion (1975) U.S. dollars. With military goods production continuing to account for approximately 21 percent of total industrial production, the value of military goods production in 1980 is approximately 25 billion (1975) U.S. dollars. Even with no increase in the size of China's armed forces, total defense expenditures in 1980 are still 9.8 percent of GDP. The rate of net accumulation of new producer's goods as a share of GDP throughout the period remains somewhat stable at 23 percent, but per capita personal consumption expenditures increase at an average annual rate of 4 percent, achieving a level of 144 (1975) U.S. dollars in 1980.[21]

Finally, these developments in the domestic economy reduce pressure on the foreign sector and, although imports of producer's goods continue to increase by almost 11 percent a year, imports of foodstuffs decline dramatically at the end of the period. Thus, total foreign trade increases in 1976 and 1977 and levels off thereafter, being only 10 percent higher in 1980 than in 1975 at a level of slightly over 7 billion (1975) U.S. dollars each way.

These obviously favorable results of simply projecting the present into the near future are based on a host of optimistic assumptions and the validity of the structural equations in the econometric model used to derive these estimates. Nonetheless, at least insofar as such forecasts of the future are concerned, these forecasts would appear—to this observer, anyway—as both plausible and feasible. The question posed in this paper is not the plausibility of any particular forecast, however, but what are the relative costs and benefits of alternative military expenditure choices available to the Chinese, assuming the results of the "balance growth" development and military strategy policy spelled out above are available to them without any fundamental change in their present policy mix.

The Real Costs of Alternative Military Expenditure Choices, 1976–80

As mentioned in an earlier part of this paper, there exists a wide variety of alternative military expenditure mixes available to the Chinese. The examples selected here for analysis are but the most obvious and simple alternatives facing the decisionmakers and are selected for the purpose of identifying the types and magnitude of the relative costs involved in their choosing to move in any particular direction. There are, of course, a large number of alternative policies which combine elements from each of these alternatives which could be analyzed. But even restricting our analysis to a few obvious and simple choices leaves us with the problem of specifying in exact detail the economic decision attributes for each of these choices, such as the rate of growth and allocation of investment. This is the very process of decisionmaking we envisage, the accumulation of a wide variety of decisions, not necessarily made simultaneously, which concern particular economic and military choices facing Chinese leader-

[21] Our estimate for the per capita personal consumption expenditures is based on a population rate of growth of 2 percent between 1975 and 1980. A lower rate, of course, would increase the rate of growth in per capita consumption expenditures.

ship. In this paper we have adopted what seems to be meaningful titles for the various sets of values assigned to the decision variables whose results are analyzed, but these are not necessarily the only or even the most optimal choices for the decision variables which would be consistent with a military strategy policy identified with these same labels.

1. The Attempt to Achieve "Superpower" Status

Although the real costs of an attempt by the Chinese to achieve the status of a superpower would appear to be prohibitive on the basis of intuition alone, it is worthwhile to specify the various ways the Chinese could attempt to do so and to determine in a quantitative manner why the real costs of this military strategy policy are indeed prohibitive. During the 1960's, the United States and the Soviet Union had average annual military expenditures of 63.4 billion and 27.7 billion current U.S. dollars, respectively. In terms of 1975 prices, these average annual military expenditures would amount to 96 billion and 42 billion (1975) U.S. dollars. If we were to assume the Chinese doubled the level of defense expenditures forecast in our "benchmark" projections over the next 5 years, i.e., an average annual increase of 25 billion (1975) U.S. dollars a year, and the increase were exclusively devoted to the acquisition of more advanced and more expensive weapons systems on a large scale, how could this decision be accomplished and with what real costs? [22]

The easiest way, i.e., the minimum economic burden, for a developing country to acquire modern weapons systems is to receive them as unilateral aid from an industrially developed and generous ally. In the early 1950's, the Soviet Union was in a position to assist the Chinese in this manner, but was unwilling to do so. In a study of China's foreign trade and capital movements, I have estimated that China received almost 2 billion U.S. dollars worth of military equipment and supplies from the Soviet Union, most of these sent to China before 1956.[23] These imports were not given to the Chinese as aid and the Soviet Union did not extend the Chinese any significant loans for this purpose. A study of the Chinese budgets reveals loans of less than 500 million U.S. dollars which were not earmarked for other purposes, and most of this $500 million was to cover the cost of the military equipment and supplies left at Port Arthur when the Soviet troops withdrew from Manchuria.[24] The possibility of the Chinese acquiring large-scale aid shipments of modern weapons systems, of course, is even less likely in the late 1970's than it was in the 1950's.

Imports of these modern weapons systems financed by foreign loans would be another way for the Chinese to acquire these systems without

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[22] The annual increases in 1976–80 would be 21.5, 23.0, 24.7, 26.0, and 28.5 billion (1975) U.S. dollars. This level of expenditures obviously would not enable China to "catch up" with the United States and the Soviet Union, but represent the initial stages of such an attempt. Representing almost 20 percent of the "benchmark" projected GDP, this level of expenditures would appear to be a potential maximum amount which the Chinese could devote to an attempt to achieve superpower status. The question we seek to answer here is if this potential maximum is actually feasible.

[23] Robert F. Dernberger, "Foreign Trade and Capital Movements of Communist China, 1949–62," unpublished Ph. D. dissertation, Harvard, 1965, pp. 175–79. These Soviet exports of military equipment and supplies to China include the transfer of Soviet military equipment in Port Arthur when the Soviet troops withdrew from Manchuria in 1955.

[24] The Soviets counter this claim of their exploiting the Chinese, requiring them to pay currently for Soviet supplies of military equipment and machinery while China was fighting the major capitalist power in the world on Russia's Pacific flank, by saying the Chinese were given significant aid in the form of large price discounts on the military equipment and machinery they purchased from the Russians.

having any impact on the domestic economic developments forecast in our benchmark projections for the next 5 years. At the end of the 5-year period, the Chinese would have accumulated over 100 billion U.S. (1975) dollars worth of modern weapons system, but also a foreign debt equal to more than 40 percent of GDP. It is unlikely that this alternative is economically feasible. Moreover, this alternative obviously is not politically feasible inasmuch as China would have difficulty finding a creditor willing to provide this much credit for this purpose due to both domestic and international political considerations.

The only other possible alternative for acquiring the desired stock of modern weapons systems as a prerequisite for becoming a superpower is to develop and produce them domestically. It should be obvious that such a policy would involve a tremendous economic cost. More important, however, my attempt to estimate this cost yielded the surprising, yet obvious, conclusion that the only way this policy is feasible is if implemented gradually.[25] Thus, even to be able to estimate the real costs of this policy choice, it must be made more realistic by significantly reducing the speed with which it is introduced. A more realistic policy with the same objective in the long run would be one which called for an increase in total defense expenditures of 20 percent a year, with the increase in defense expenditures over those estimated in our benchmark projections being accounted for by the desired increase in production of modern weapons systems.[26] This desired increase in production is realized because the defense industries are assigned the highest priority in the allocation of resources.[27] The rate of increase in the level of investment must also be increased from 10 to 20 percent in order to make this policy choice even potentially feasible, i.e., it would not be possible to nearly double the projected level of output in the defense industries within 5 years in the absence of any increase in the projected level of investment. For much the same reason, the rate of increase in the supply of skilled labor must be increased from 10 percent to 15 percent.[28] Finally, the unit real resource costs of the incremental increase in the projected level of production in the defense industries is assumed to be 25 percent higher than the average unit real resource costs in the rest of the defense industries to reflect the shift in production to modern weapons systems.

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[25] My first attempt to specify this policy decision called for a doubling of defense expenditures compared to those in our benchmark projection, with the resulting increase in defense expenditures being set as a targeted increase in the level of domestic industrial production of military goods. The unit real costs of this incremental output was assumed to increase by 50 percent compared to their average level in our benchmark projections to reflect the shift to the production of modern weapons systems. The results showed this policy was infeasible as the resulting demand of the defense industries alone immediately exhausted China's domestic supply of scarce capital and skilled labor and the required imports of these producer's goods and services, even if available, were implausibly large.

[26] As a result of this specification for the policy of attempting to achieve superpower status, output in the military industries would be 90 percent higher than in the benchmark projections in 1980 and almost one-half of the total output would consist of modern weapons systems.

[27] After the needs of the defense industries to meet their production targets are satisfied, 25 percent of the residual investment is allocated to the producers goods industries and to the consumers goods industries, and 50 percent is allocated to the agricultural sector. The values for these decision variables were not chosen arbitrarily, but were determined as the chances for the feasibility of this strategy were improved in the course of our efforts to obtain estimates for its economic consequences.

[28] Inasmuch as a service sector is not included in the econometric model used to estimate the real costs of alternative military expenditure choices, the real costs of an increase in the supply of skilled labor, except for the relatively high wages they are paid, are not included in our estimates. Nonetheless, a significant rise in the rate of increase in the supply of skilled labor must be achieved in an attempt to achieve superpower status, as specified in our analysis, or the attempt is infeasible at its inception.

Despite doubling the rate of increase in the level of investment and assuming the Chinese could achieve a 50-percent increase in the rate of increase in the supply of skilled labor, the program of a gradual transition to the large scale domestic production of a modern weapons system, as specified above, would not involve a reduction in the rate of growth of GDP. Even though the increased output in the defense industries is obtained by reallocating investment formerly going to the nondefense sectors, the increase in the total level of investment made available offsets to some extent the necessary decline in output in those sectors. Thus, a loss of total output is not one of the real costs of this program. The approximately equivalent increase in defense industry output and decline in nondefense sector output, compared with their level of output in the balanced growth benchmark projections (hereafter referred to as BGBM projections), however does result in a slight restructuring of the economy. In 1975–80, industry's share of GDP increases from 38 to 42 percent, compared with 38 to 40 percent in the BGBM projections.[29]

In terms of output, of course, this program does achieve a very rapid increase in the domestic production of modern weapons systems; the specific purpose of the program. In 1980, the industrial production of military goods, about one-half of which are modern weapons systems, would total almost 50 billion (1975) U.S. dollars compared to 25 billion (1975) U.S. dollars in the BGBM projections and military goods production would account for 38 percent of total industrial production (vs. 21 percent), while total defense expenditures would account for 17 percent (vs. 10 percent) of GDP.

Nonetheless, the objective of increasing the industrial production of military goods, that is, modern weapons systems, is achieved at the expense of all other sectors of the economy and it is the reduction in nondefense sector output, compared with their level of output in the BGBM projections, which generate the real costs of this program. Inasmuch as the defense industries have first priority in the allocation of investment, and despite the doubling of the rate of increase in the level of investment, all other sectors end up with a smaller absolute level of investment than in the BGBM projections. With a lower level of investment, that is, output, in the producer's goods sector and a higher level of total investment, imports of producer's goods grows very rapidly (34 percent a year) and, by 1980, account for over 50 percent of total domestic supply of producers goods. Despite the fact that 50 percent of the investment which remains after the needs of the military industries have been met is allocated to the agricultural sector, the rate of growth in agricultural production declines to 6.4 percent, compared with 7.5 percent in the BGBM projections. This lower rate of growth requires much larger imports of foodstuffs to sustain a satisfactory standard of living for the rural labor force.[30] Thus, one of the most significant results of the attempt to develop China's production of modern weapons systems would be a tremendous increase in import de-

[29] Agriculture's share of GDP declines from 37 to 33 percent, compared with 37 to 35 percent in the BGBM projections.

[30] If the standard of living of the rural labor force included in the BGBM projections were to be maintained, imports of foodstuffs would need to increase by 57.5 percent a year. If the standard of living of the rural labor force was to be held constant at the 1975 level in 1975–80, imports of foodstuffs would need to increase by 51.5 percent a year.

mands; both the demand for imports of producers goods to meet domestic investment needs and the demand for foodstuffs due to the shortage of investment for the nondefense industry sectors.

Our results clearly show that even the gradual and somewhat limited program for developing China's production of modern weapons systems specified above is infeasible, unless the Chinese had access to and were willing to utilize foreign borrowing on a large scale. If the Chinese desired to maintain the same standard of living for the agricultural labor force as included in the BGBM projections, they would be forced to borrow 64 billion (1975) U.S. dollars to finance their acquisition of 59 billion (1975) U.S. dollars worth of modern weapons systems over the same period. If the standard of living of the agricultural labor force were to be held constant at the 1975 level, they would be forced to borrow 53 billion (1975) U.S. dollars. If foreign borrowing is not available, the desire to acquire modern weapons systems by producing them domestically is clearly infeasible—at least at the pace specified in our example here. The resulting lower growth in agricultural production and the rapidly rising level of exports required to finance necessary producers goods imports would continuously reduce the domestic supply of consumption goods. If the labor force in the industrial sectors were allocated consumers goods equivalent to their wages, those in the agricultural sectors would be starving by the end of the 5-year period. If the available consumer's goods were allocated to everyone in the labor force equally, the standard of living of the agricultural labor force would decline by about 16 percent a year.

This exercise serves to provide the details of why an attempt to catch up with the superpowers in modern weapons system is infeasible in China, which both we and the Chinese already know or could deduce without the aid of an econometric model. With the aid of our econometric model, however, it would be possible to continuously reduce the pace at which the domestic production of modern weapons systems was to increase, adjust the rate of increase in the level of investment and its allocation, et cetera, until a feasible program was determined. Such an attempt is well beyond the time and computer budget available to me.[31] Nonetheless, our analyses of the economic consequences of this one specific program to acquire modern weapons systems indicates rather forcefully that a feasible program would have to be relatively small in the near future.

2. Attempt To Modernize

A much more feasible, yet still beneficial, policy option available to the Chinese would be an attempt to "modernize" China's armed forces by increasing the available supply of conventional weapons systems. The particular form such a policy could take would depend on the Chinese leaders' anticipation of the direction, magnitude, and particular nature of potential external threats and their decision as to the response capabilities China must acquire to meet those threats, as well as the military prerequisites for any country desiring to be a major participant in the contemporary world's balance of power. The three

[31] This solution of the problem by repeated simulation (trial and error) is similar, of course, to the way in which the decisionmakers would achieve a feasible solution.

most obvious areas in which the Chinese can expand and develop their military capabilities in a conventional manner are an increase in the production of weapons, armor, and transport to increase the firepower and mobility of the PLA, an expansion of China's airpower, and the development of China's navalpower.[32] For the purposes of estimating the relative real costs of implementing a military strategy policy which attempts to modernize China's military capabilities in one or a combination of these directons, it is assumed the program of modernization proceeds at a magnitude and a pace about half that specified for the program seeking superpower status analyzed in the previous section of the paper and involves no increase in real resource unit costs in the defense industries.[33]

Compared with the results of the program for attaining superpower status, however, the lower real resource unit costs and lower rate of increase in production in the defense industries in the program for modernization, yields a larger amount of investment for the non-defense sectors, even despite the lower rate of increase in the level of total investment. Thus, output in all sectors and total output are higher than in the BGBM projections with no significant change in the structure of the economy.[34] Nonetheless, the defense industries and total defense expenditures do increase their relative importance in the economy; output in the defense industries accounting for 25 percent of total industrial production (compared to 21 percent in the BGBM projections) and total defense expenditures accounting for 12 percent of total GDP (compared to 10 percent) in 1980. Over the 5-year period, 1975–80, the program of modernization adds almost 2 billion U.S. (1975) dollars more military goods than is provided in the BGBM projections. On the production side, therefore, this program certainly appears to have nothing but benefits—more military goods production and more production in all other sectors as well. Compared to these obvious benefits, what are the real costs and is this program feasible?

It should be no surprise that the real costs of the program to modernize China's armed forces, as specified here, ends up being much smaller in magnitude, but with much the same consequences as the real costs of the program to attain superpower status. In fact, any program calling for a faster rate of increase in the industrial production of military goods requires more investment in that sector which must come either from reduced investment (and, therefore, output)

[32] The distinction between the development of modern, sophisticated weapons systems and conventional weapons systems made here is not discretely defined because I lack the necessary technical knowledge of weapons systems to provide such a distinction. For our purposes, fortunately, a specific identification of these weapons systems is not required. What is implicitly included as conventional weapons in our analysis, however, are those military aircraft, naval vessels (including submarines), tanks, personnel carriers, et cetera, which China is producing or could produce within the near future on a significant scale with the technology and resources available. Other contributors to this volume will undoubtedly identify the specific military weapons which could be included in this category.

[33] Specifically, the output of the defense industries is scheduled to increase at a rate of 15 percent a year (compared to 9 percent in the BGBM projections and 20 percent in the program for attaining superpower status), the rate of increase in the level of investment is set at 15 percent (compared to 10 and 20 percent), the Chinese are assumed to be able to attain a rate of increase in the supply of skilled labor of 12.5 percent (compared to 10 and 15 percent). As in the program for attaining superpower status, the desired level of output in the defense industries are given first priority in the allocation of scarce resources; the residual supply of capital and skilled labor allocated to the other sectors in proportion to their relative allocative shares in the BGBM projections.

[34] In 1975–80, compared with BGBM projections, the program to modernize China's armed forces results in an annual rate of increase in GDP of 10.4 versus 8.8 percent; industry's share in GDP increases from 37.8 to 40.7 percent versus from 37.8 to 40.1 percent, and agriculture's share decreases from 37.1 to 34.2 percent versus from 37.8 to 34.8 percent.

in the nondefense sectors, or from increased output of producer's goods which must come from reduced investment (and, therefore, output) in the nonproducers good sectors, or from imports. In the program to modernize China's armed forces specified here, the rate of investment was increased to offset the need to reduce output in the nondefense sectors to provide for the investment which would have to be reallocated to the defense industries. Yet, even though this allowed for an increase in the domestic production of producer's goods, the gap between the domestic demand for producer's goods (total investment) and their domestic supply grows even faster between 1976 and 1980, i.e., imports of producer's goods increases by 29 percent a year and total 47 billion U.S. (1975) dollars for the period as a whole.[35] Moreover, despite the increase the level of investment and output in the agricultural sector; the increased output in the consumer's goods industries, increased urban labor force, and the increased level of imports of producer's goods also increases the demand for agricultural output for inputs in industry, urban consumption, and for exports. Thus, if the standard of living of the agricultural labor force given by the BGBM projections is to be achieved under this program of modernization, imports of consumer's goods (i.e., foodstuffs) must increase by 21.8 percent a year in 1976–80, totaling 16 billion U.S. (1975) dollars for the period as a whole.[36] In order to finance this program of modernization without any impact on the standard of living in China over the next 5 years, therefore, requires over 14 billion U.S. (1975) dollars in either foreign aid or foreign loans. Although the program to acquire superpower status would require foreign aid and loans almost four times larger, even this significantly lower level can be rejected as infeasible.

In the absence of this foreign assistance, the only other source for providing the necessary resources to finance this program of modernization is reduced consumption of the labor force; the agricultural sector providing the exports necessary to finance imports of producers goods with the consumption sector receiving the residual share of the economy's production of goods and services. If the industrial labor force is allocated consumer's goods equivalent to their wages and the agricultural labor force is allocated the residual, the standard of living of the agricultural labor force would decline by 2.6 percent a year in 1976–80. Clearly this real cost is physiologically feasible, but it would contradict a fundamental objective of the Chinese leadership and, even more important, would present that leadership with serious problems, both political and administrative, due to a worsening of the gap between urban and rural standards of living.

A final option, however, is not only feasible, but also compatible with the present policies being implemented in China; the distribution of the residual share of output to both rural and urban consumers on a more equitable basis. For purposes of illustration, we assume the extreme case where the entire labor force in the economy is to share the available supply of consumers goods equally. In this case, the program of modernization would be feasible in the short run inasmuch as the

[35] The same estimates for the program to attain superpower status were 34 percent and 85 billion U.S. (1975) dollars. The same estimates in the BGBM projections were 10.5 percent and 27 billion U.S. (1975) dollars.

[36] Interestingly enough, if the standard of living of the agricultural labor force is held constant at the 1975 level, required imports of consumer's goods (i.e., foodstuffs) would not increase over the period, but would average about 890 million U.S. (1975) dollars annually throughout 1976–80.

standard of living of the labor force in 1976–80 would be almost one-third higher than that of the agricultural labor force in 1975. However, there are two serious problems with this option for financing the program of modernization. There is the obvious problem of implementing a rationing and distribution system which obtains this result without having an effect on the incentives and efficiency of the urban labor force, who obviously would suffer a considerable loss in their standard of living. Equally important, however, once the gains of the one time redistribution of consumption has been achieved, the standard of living of the entire labor force begins to decline and at the end of the period it is declining at a rate of about 5 percent a year.

The two specific examples of an attempt to increase the production in the defense industries beyond their levels of output in the BGBM projections presented above, serve to illustrate a conclusion which would hold true for any military strategy policy with the same intent. Any increase in defense industry production beyond their level of output in the BGBM projections would inevitably lead to either an increase in foreign aid or borrowing or a decline in the standard of living of the labor force or both. If foreign aid or borrowing from abroad and a decline in the standard of living are both claimed to be infeasible given the present policy constraints of the Chinese leadership, than any increase in the domestic production of military goods beyond their production levels in the BGBM projections would also be infeasible.[37]

In our determination of the real costs of these two programs, the claim was made that it would be possible through trial and error to find the proper rate of increase in the rate of investment and its allocation which would be feasible even though the particular program being analyzed turned out not to be feasible. By now, the reader may appreciate the real meaning of our BGBM projections; it represents the results of just such an attempt to discover the optimum potential growth path of the Chinese economy, over the near future, subject to the constraints of no foreign aid or borrowing and no decline in the standard of living. The infeasible examples of the two alternative military strategy policies have been presented as the best means of showing exactly why the BGBM projections can be called optimal and why any larger scale of defense expenditures and production is claimed to be infeasible.

3. The Balanced Growth Benchmark Projections Reinterpreted

The BGBM projections are claimed to be the optimal feasible development and military strategy policies over the next 5 years only in the following sense: if merchandise trade in the foreign sector must be balanced on an annual basis, the standard of living should increase by approximately 4 percent a year, and the domestic production of military goods is to increase by 7.3 percent a year, continuing to account for approximately one-fifth of total industrial production, these constraints determine the "optimum" rate of increase in the level of investment (15 percent) and its allocation so as to yield the maximum rate of growth for GDP (8.8 percent). If an attempt were

[37] There are increasing indications that the Chinese are now considering long-term foreign loans as an acceptable means for alleviating this constraint on their economic development potential.

to be made to increase the attainment of any one of these three basic objectives, i.e., the accumulation of a surplus in the balance of trade, a faster rate of increase in the standard of living, or a faster rate of increase in the domestic production of military goods, a loss must be suffered in the attainment of the other two objectives.

The BGBM projections, however, do include what would appear to be significant potential for the achievement of all three goals: Significant growth without foreign aid or borrowing; a not very rapid, but nonetheless positive and steady, increase in the standard of living; and a sizable and increasing level of output in the defense industries. Thus, even though the attempt to achieve superpower status and, to a lesser extent, the program to modernize China's armed forces are judged to be infeasible, the BGBM projections, which are feasible, does allow for the development of prototypes—modern weapons systems on a limited scale—and a modest expansion of China's air and naval capabilities, as well as a significant accumulation of conventional armaments and weapons for the modernization of China's armed forces.

For example, the BGBM projections for 1980 call for total defense expenditures to be 9.8 percent of GDP with an annual production of military goods worth 25 billion U.S. (1975) dollars. This ratio of defense expenditures to GDP would be higher than that experienced in most other countries in the world in 1963–73.[38] The absolute level of defense expenditures projected for 1980 should easily make China the world's third largest military power, with military expenditures well above those of any country other than the United States and the Soviet Union; China's projected defense expenditures in 1980 being approximately equal to two-fifths of the average annual defense expenditures of the Soviet Union in 1963–73, one-third of those in the United States, and more than 20 percent larger for those in France, West Germany, and the United Kingdom combined.[39] There should be no question but that the magnitude of defense expenditures and production included in the BGBM projections would allow for a significant development of modern weapons systems in China and considerable progress in the modernization of China's armed forces.

But these levels of defense expenditures and production are presented as the maximum feasible levels, with no foreign aid or borrowing and a steady, but small increase in the standard of living. The Chinese leadership, of course, may well choose to set a lower level of defense expenditures and a slower pace of increase in the production of military goods, and their decision to do so obviously would be influenced by the potential economic benefits to be gained. Taking the BGBM projections as the existing policy choice and limiting our estimates to the marginal costs of this choice over the next year alone, i.e., the immediate benefits to be obtained from an incremental reduction in military spending, these potential benefits can be summarized as follows. A 1 percent reduction in the level of output in the defense industries would set free enough producer's goods, skilled labor, and

[38] For obvious reasons, among those countries for which estimates are available, the exceptions are Albania, Cambodia, the Republic of China, Egypt, Iran, Iraq, Israel (the highest ratio in the world), Jordan, North Korea, Laos, Saudi Arabia, Syria, North Vietnam, Republic of Vietnam, and Yemen. Estimates for 132 countries are presented in *World Military Expenditures and Arms Trade, 1963–73*, U.S. Arms Control and Disarmament Agency, Washington, D.C. 1975.

[39] See *World Military Expenditures and Arms Trade, 1963–73, op. cit.*

unskilled labor to increase output in the producer's goods industries by 0.5 percent, in the consumer's goods sector by 0.5 percent, and in the agricultural sector by 0.01 percent. The net change in output in the various sectors will result in a 0.06-percent increase in GDP. The net increase in employment and demand for consumption via an increase in the wage bill due to this increase in GDP is insignificant, as is the increase in the supply of consumption; [40] but the increase in the supply of consumption is 3.7 times the increase in demand for consumption. Therefore, even though insignificant, there is a net increase in the standard of living of the agricultural force.

These marginal costs of defense expenditures, therefore, may induce the Chinese to adopt a military expenditure policy which calls for defense expenditures at a lower level than those spelled out as the optimum feasible level in the BGBM projections. These decisions, of course, will depend on a great many noneconomic cost considerations, such as the specific military objectives of their military strategy policies, as well as their general political and social objectives. Given the available empirical evidence of their past behavior, however, their final choice will undoubtedly be close to that presented as the optimum feasible level of their defense expenditures in this paper.

4. *Disarmament*

Although a not very probable military strategy policy choice in the near future in China, the economic consequences of disarmament obviously is a very important factor involved in any consideration of this policy by the Chinese and a consideration which must act strongly in its favor. The marginal costs of a small reduction in the production of military goods indicate the substantial economic gains available to the Chinese from a significant reduction in the present and probable future levels of defense expenditures in that country. Unfortunately, domestic and international political considerations far outweigh these potential economic gains and, for the present at least, the provision of a modern defense establishment with the military capability to both counter its perceived external threats and achieve its own foreign policy intentions can be expected to be a prerequisite of any Chinese leadership group. Nonetheless, it is worth determining the potential economic benefi[illegible] a military strategy policy of disarmament in China for the purpose of obtaining a quantitative measure, not only of the potential economic gains disarmament offers to China and other agricultural, developing countries, but, more important, how much a cost in terms of lost growth and depressed standard of livings these countries pay for the unfortunate marriage of both industrialization and military power as joint objectives of modernization in the postwar era.

To obtain our estimates of the economic consequences of a disarmament policy, a program is specified which calls for the 1975 level of production in the defense industries to be cut in half and held at that reduced level in 1976–80; the size of China's armed forces and their

[40] The net increase in the supply of consumption comes from combining the increase in agricultural production and industrially produced consumer's goods, the reduced demand for exports following the decline in imports as a result of the increased domestic production for producer's goods, and the increase in the demand for agricultural products as inputs in the increased industrial production of consumers goods.

maintenance costs assumed to remain at the 1975 level. Fixed capital already in existence in the defense industries is assumed to be fixed, i.e., not convertible to civilian production, with a depreciation rate of 10 percent; one-half of the depreciated fixed capital assumed to require replacement in order to maintain the steady level of output in these industries in 1976–80. The rate of increase in investment is assumed to remain the same as in the balanced growth benchmark projections and, after the replacement requirements of the defense industries have been met, the remaining investment is assumed to be allocated to the various sectors proportionate to their share of investment in the BGBM projections. The immobility of fixed capital in the defense industries is an extreme assumption which biases downward our estimates of the economic benefits of disarmament, i.e., our estimates are limited to the economic benefits gained from diverting new acquisitions of producer's goods which would have gone to the defense industries to the various civilian sectors and does not include those benefits which could be obtained from a similar diversion of producers goods already incorporated in the fixed capital of the defense industries.

The reason for making this restrictive assumption is to show that even when investments already made in the defense industries are considered as sunk costs and lost to the civilian sectors forever, the benefits of disarmament are still substantial. However, even with the same rate of investment and some of that investment which formerly went to the defense industries now going to other sectors, some of which have lower capital-output ratios (consumer goods industries) and higher capital-output ratios (agriculture), the net effect in total GDP and its rate of growth is negligible. Thus, compared with the BGBM projections, the disarmament program spelled-out above yields an identical growth rate in 1976–80 and same level of GDP at the end of the period. The significant changes, of course, are in the different structure of the economy which results from the disarmament program.

Inasmuch as the agriculture sector is now allocated a larger share of investment than in the BGBM projections, the decline in agriculture's share of GDP is slowed down considerably. While a decline in agriculture's share of GDP is often viewed as an indicator of successful industrialization, this is only true when it is the result of industrial output growing faster than agricultural output when both sectors are experiencing significant growth. A decline in agriculture's share of GDP brought about by the failure of the agricultural sector to grow is no indicator of success. Thus, in China where standards of living are still low and the demand for agricultural products still exceeds the available supply, the slower decline in the share of agriculture in GDP while GDP is growing at 8.8 percent a year is an indicator of success, not failure, as will be made clear later on. On the opposite side of the coin, the rate of increase in industry's share of GDP is also slowed down in the disarmament program, but there is a significant shift in the structure of output within industry itself. Defense production, which accounted for over 20 percent of industrial output in the BGBM projections, now accounts for only 7 percent of the total, with defense expenditures accounting for less than 5 percent of total GDP. Nonetheless, even in the program of disarmament being analyzed here, over 40 billion U.S. (1975) dollars worth of new military goods are produced by the defense industries in 1976–80.

It is the faster rate of increase in the civilian sectors, offset in the totals by the lack of any growth in defense industries, which produces the significant economic benefits of disarmament. With the rate of increase in the level of investment the same, and a faster rate of increase in the domestic production of producer's goods, necessary imports of producers goods in the program of disarmament are only one-fourth those in the BGBM projections. In 1980, therefore, the level of necessary foreign trade is only 3 billion U.S. (1975) dollars each way.[41] The increase in the rate of growth of the industrial production of consumers goods and agricultural production, along with the lower level of required exports to pay for necessary imports, means the residual category of consumption in the rural sector is the largest benefactor of the program of disarmament. In 1976–80, per capita consumption of the rural labor force increases by 7.4 percent, being 20 percent higher in 1980 under the disarmament program specified here than in the BGBM projections. An increase of one-fifth in the standard of living of the poorest and largest segment of the labor force in a developing country where the standard of living is very low, of course, is a most powerful economic appeal for disarmament.

Conclusion

It will come as no surprise if some readers were to object to our attempt to estimate the economic consequences of alternative military expenditure choices for any one of several reasons. I obviously have not specified in great detail any particular military expenditure policy the Chinese are likely to adopt. Quite the contrary, I have tried to examine the economic consequences of what are set forth as unadulterated and simplistic examples which illustrate the aggregate results of a great many different levels and combinations of output in particular enterprises within the defense industries. I also purposefully ignored the host of important noneconomic considerations involved in the adoption of any particular military expenditure policy, or the reasons for adopting those policies. Quite simply, I have attempted to estimate, in a preliminary way, the economic consequences of those military expenditure policies which result in a substantial increase in the level of total output in the defense industries with increased real resource unit costs, a smaller, but still significant, increase in the level of total output in the defense industries with no increase in real resource unit costs, the continuation of the present share of GDP being devoted to defense expenditures, and a significant reduction in the level of total output in the defense industries; ignoring the reasons why such a policy would be adopted and the particular form it would take to yield these aggregate results.

There also will be those who object to the rather inflexible and mechanical means by which the estimates for the real cost of these various military expenditure choices were estimated, i.e., it is impossible to capture the complex variety of economic activities and the interde-

[41] While the program of disarmament greatly reduced China's dependence upon, it does not eliminate the need for foreign trade. In fact, the level of foreign trade is increasing faster than GDP at the end of the period so that the foreign trade dependency ratio is also increasing, even though it is at a lower level and increasing slower than in the BGBM projections.

pendence and interactions among those activities in an econometric model. Nor is it safe to assume the quantitative relationships within and among even those sectors included in the model remain stable over time. Yet, the purpose of the methodology used in this paper is not to replicate reality in all its detail. Rather, our purpose is to explicitly present the assumptions we make in simplifying that reality so as to make an estimate of the real costs possible and to make clear the specific steps taken to obtain those estimates. In other words, the methodology utilized is the best means for insuring our estimates are logical and consistent; it is up to the reader to judge their "reality."

Thus, I plead guilty to the above criticisms and, at the same time, claim they do not negate necessarily the validity of the estimates presented in this paper: My specific purpose, which I hope has proven successful, has been an attempt to conceptualize and stimulate the chain of reasoning involved and the relative importance of the conclusions in the decisionmaker's evaluation of the economic consequences of various military expenditure choices. If we have been successful in this attempt, rather than failing to deal realistically with actual economic development in China, our findings should represent important factors entering the decisions which will determine that reality in the near future.

Appendix

Specification of the Projection Model of the Chinesf Economy Used in Obtaining Estimates for the Real Costs of Alternative Military Expenditure Choices

The economy is assumed to consist of only eight separate economic activities or sectors: the industrial production of producer's goods (X_1), the industrial production of consumer's goods (X_2), the production of agricultural products (A), the provision of labor services (N), the provision of military equipment and services (D), the exchange of goods with foreign countries (the foreign trade sector), the accumulation and allocation of producer's goods (I_X), and the consumption of goods and services by the labor force (C). The subscript t is adopted for all endogenous variables to represent the relevant calendar year with a value of zero assigned to the base year and the values 1, 2, 3, et cetera, for all the ensuing years. The values for the exogenous variables are assumed to remain constant with changes in t and, therefore, those variables do not have t as a subscript.

The producer's goods sector (X_1) is defined to include the production of electric power, coal, petroleum, iron and steel, nonferrous metals, metal processing, basic chemicals, and building materials. The consumer's goods sector (X_2) includes the production of paper, textiles, processed foodstuffs, pharmaceuticals, leather, printing, and industries manufacturing daily necessities. The agricultural sector (A) includes the production of unprocessed plant and animal products. The defense sector (D) includes the domestic production of military equipment and supplies (D_X), the import or military equipment and supplies (M_D), and the expenses for the maintenance of military personnel (G). The investment sector (I_X) includes the accumulation of capital by means of the domestic production of producer's goods (X_1) and the import of producer's goods (M_I) and the allocation of capital to the two civilian industrial sectors, the agricultural sector, and the defense sector.

The labor sector consists of the provision of the total labor force (N), divided into skilled labor (N_S) and unskilled labor (N_B), and the allocation of labor to the two industrial sectors, the agricultural sector, and the defense sector. The foreign trade sector includes the export of agricultural products and consumer's goods (E), the import (M) of both producer's goods (M_I) and military equipment and supplies (M_D), and the receipt, extension, and repayment of foreign loans (F). Finally, the consumption sector consists of the agricultural products (C_A) and consumer's goods ($C_X{}^2$) consumed by the labor force and their dependents.

The decisionmakers in the model are assumed to be the "planners," a centralized group with the authority and ability to implement the decisions (plans) they make. The assumption is made that the planners have the ability to determine and implement 13 specific variables in the model, called planners' variables. Four of the planners' variables determine the share of the available producer's goods (investment) allocated to the production of producer's goods (γ), consumer's goods (ϕ), agricultural products (λ), and military equipment and supplies (π). Subject to the condition that each of these planners' variables must be less than one and their sum must be equal to one, the planners are assumed to be free to choose the value of any three of these variables.

It is also assumed that the planners determine the rate of increase in investment (r) or the supply of producer's goods. The planned level of investment in a given year is equal to the level of investment in the preceding year multiplied by the quantity $(1+r)$ and the actual level of investment (I_x) in year t is assumed to equal the planned level of investment in year t.

$$I_{xt}=I_{x0}(1+r)^t \quad (1)$$

The actual level of investment (supply of producer's goods) is obtained from domestic production (X_1) or from abroad through imports of producer's goods (M_I).

$$I_{xt}=X_{1t}+M_{It} \quad (2)$$

The planners are assumed to be able to choose and implement the desired level of investment, therefore, by securing any shortage of producer's goods from abroad. If they are unable to obtain the necessary imports of producer's goods from abroad, the planned rate of increase in investment or the planned share of investment allocated to the producer's goods sector must be changed. The planned increase in the level of investment and its allocation does not allow for private investment. The assumption is made in the model that self-provided investment is made in the agricultural sector and this self-provided investment is proportionate to the producer's goods allocated to agricultural production by the planners. The extent to which the peasants make complimentary investment in agriculture is included in the model as an institutional variable. Specifically, the peasants are considered to determine the desired level of investment based on the amount of investment provided by the state and this desired level of investment in agriculture is equal to e times the amount of producer's goods allocated by the planners to agricultural production (λI_x). Thus, the amount of self-provided investment is equal to $(e-1)\lambda I_x$. As is true of the planners' variables, the values assigned to the institutional variables, such as e, may be changed from year to year, depending upon the reorganization of agricultural institutions and the decisions of those who control those institutions.

Twenty-one of the 39 structural equations in the model refer to the supply and demand for labor. This proliferation of equations for the labor sector is due to the assumption of two types of labor (N), the allocation of unskilled labor (N_B) to four sectors of production and to the military sector, the allocation of skilled labor (N_S) to three sectors of production, and the necessary equilibrium condition that supply equals demand for each of these uses of labor.

We begin on the supply side. The rate of increase in the total labor force (n) is specified as an institutional variable; i.e., an exogenously given value. The total supply of labor (N^S) in year t is equal to the total labor supply in the previous year times the quantity $(1+n)$.

$$N^S{}_t=N_0(1+n)^t \quad (3)$$

The rate of increase in the supply skilled labor (p) also is assumed to be an exogenously given value. The supply of skilled labor ($N_S{}^S$) in year t is equal to the supply of skilled labor in the previous year times the quantity $(1+p)$.

$$N^S{}_{St}=N^S{}_{S0}(1+p)^t \quad (4)$$

The supply of unskilled labor ($N_B{}^S$) is determined by subtracting the supply of silled labor from the total labor force.

$$N^S{}_t-N^S{}_{St}=N^S{}_{Bt} \quad (5)$$

The rates of increase in the total supply of labor and the supply of skilled labor are assumed to be exogenous variables for a very practical reason: we don't have a better method for estimating these quantities.

The production functions in the model are basically those of fixed proportions and constant returns to scale. In other words, the various inputs are assumed to be used in fixed proportions in each of the production sectors and the average and marginal productivity of additional units of this fixed bundle of inputs is assumed to be constant. The potential output in the two civilian sectors (X_1 and X_2), the agricultural sector (A), and the production of military equipment and supplies (D_X) in any given year is equal to the output (capacity) of that sector in the base year (o) plus the reciprocal of the capital-output ratio times the amount of producer's goods allocated to that sector between the base year and the given year.

Given the allocation of capital to each sector, there is no difficulty in obtaining the necessary unskilled labor required (demanded) inasmuch as the assumption is made that unskilled labor is in excess supply. If the quantity of unskilled labor demanded exceeds the available supply, the model's estimates will show this to be the case and unskilled labor will replace capital as a scarce resource in the economy, i.e., there is no possible substitution of labor for capital. In the agricultural sector and the production of military equipment and supplies there is no difficulty in obtaining the necessary skilled labor inasmuch as the assumption is made that skilled labor is not an input in the agricultural sector and the production of military equipment and supplies has top priority in securing inputs of skilled labor. Therefore, unless the excess supply of unskilled labor is eliminated, the output of agricultural products and military equipment and supplies is determined solely by the amount of capital allocated to these two sectors; i.e., their actual output is equal to their potential output.

If there is a scarcity of unskilled labor—total demand exceeds the available supply—the shortage is assumed to be borne entirely by the agricultural sector. When this happens, actual output still is equal to potential output in the defense industries, but actual output in agricultural is equal to the available supply of unskilled labor times the average productivity of unskilled labor in that sector. With the shortage of unskilled labor, potential output exceeds actual output and there exists excess capacity in agriculture.

Thus, actual output of the defense sector (D_X) in year t is equal to output in the previous year plus the product of the producer's goods allocated to the defense industries (πI_x) times one over the marginal capital-output ratio in the defense sector $\left(\frac{1}{V_D}\right)$.

$$D_{Xt} = D_{Xo} + \frac{\pi}{V_D} I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right] \qquad (6)[1]$$

$$\sum_1^t I_{xt} = I_{xo}\left[\frac{(1+r)^{t+1}(1+r)}{r}\right]$$

Actual output in agriculture (A) in year t is equal to output in the previous year plus the product of total investment in agriculture ($e\lambda I_x$) times one over the marginal capital-output ratio in agriculture $\left(\frac{1}{V_A}\right)$ or equal to the total supply of unskilled labor in the agricultural sector (N^S_{BA}) times the average productivity of unskilled labor in agriculture (L_A); whichever is smaller.[2]

$$A_t = \text{Min}\left\{\left(A_o + \frac{e\lambda I_{xo}}{V_A}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]\right),\ L_A N^S_{BAt}\right\} \qquad (7)$$

Agricultural raw materials are assumed to be used as inputs only in one industrial sector; the consumer's goods sector. That sector, however, is assumed to have no difficulty in obtaining the necessary inputs of agricultural raw materials, i.e., the consumer's goods industries are assumed to have first priority in the allocation

[1] The total investment between year o and year t, including investment in year t is

[2] The first means of determining the level of agricultural output holds as long as producer's goods are the scarce input and unskilled labor is in excess supply; the second when unskilled labor is the scarce input, i.e., demand exceeds supply. The quantity $e\lambda I_x$ represents total investment in agriculture and is the sum of state provided investment λI_x and self-provided investment by the peasants $(e-1)\lambda I_x$.

of agricultural output. Any shortage of agricultural products is compensated for by an equal reduction in exports. Of the four inputs in the production sectors in the model, therefore, agricultural raw materials are used in only one sector and are never scarce, i.e., they do not determine the level of output in any of the production sectors.

Capital, of course, is the major scarce resource. This input determines the level of output in the defense industries and in the agricultural sector, as long as unskilled labor is in excess supply. When the supply of unskilled labor is deficient, the shortage of that input is completely absorbed at the expense of agricultural production. Skilled labor also is assumed to be a scarce input with any shortage or gap between demand and supply completely absorbed by reductions in producer's goods and consumer's goods industrial production.

The demand for skilled labor in each of these sectors is determined by estimating what output would be in the absence of a shortage of skilled labor. This potential is then divided by the average productivity of skilled labor in these two sectors to determine their demand for skilled labor. If the available supply of skilled labor is less than demanded, the available supply is allocated to these two sectors in proportion to their demand for skilled labor,[3] and the actual output is estimated by reducing the potential output by an amount equal to the shortage of skilled labor times the average marginal productivity of skilled labor.

The first step in determining the level of actual output in the two civilian industrial sectors, therefore, is to determine the supply of skilled labor available for those two sectors after the demand of the defense industries is satisfied. The total supply of skilled labor (N^S_S) was determined in equation 4, above. The demand of the defense industries for skilled labor (N^D_{SD}) in year t is equal to the actual output of the defense industries, determined in equation 6, multiplied by the reciprocal of the average productivity of skilled labor in the defense industries $\left(\frac{1}{\alpha_3}\right)$.

$$N^D_{SDt}=\frac{1}{\alpha_3}\left(D_{xo}+\frac{\pi}{V_D}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]\right) \tag{8}$$

It is assumed the defense industries have first priority in the use of skilled labor and, therefore, that sector's demand for skilled labor ($N_{SD}{}^D$) is equal to its supply of skilled labor ($N_{SD}{}^S$).

$$N^S_{SDt}=N^D_{SDt} \tag{9}$$

To determine the supply and demand of skilled labor in the two civilian industrial sectors, we first determine the potential level of output in each of those sectors. The potential level of output in the producer's goods industries in year t is equal to output (capacity) in the base year(X_{1o}) plus the product of producer's goods allocated to the producer's goods industries (γI_x) since the base year through year t times one over the marginal capital-output ratio in the producer's goods industries $\left(\frac{1}{V_1}\right)$. Or,

Potential output in producer's goods industries in year t=

$$X_{1o}+\frac{\gamma}{V_1}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]$$

The potential level of output in the consumer's goods industries in year t is equal to the output (capacity) in the base year (X_{2o}) plus the product of the producer's goods allocated to the consumer's goods industries (ϕI_x) since the base year through year t times one over the marginal capital-output ratio in the consumer's goods industries $\left(\frac{1}{V_2}\right)$. Or, potential output in the consumer's goods industries in year t =

$$X_{2o}+\frac{\phi}{V_2}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]$$

[3] It would be possible, of course, to allocate the available supply of skilled labor to these two industrial sectors on the basis of any set of desired weights. The assumption made in the model merely assumes the planners would allocate the scarce supply of skilled labor to these two civilian industrial sectors in the same relative priority they allocated capital to these two sectors.

The demand for skilled labor in the producer's goods industries (N^D_{S1}) and in the consumer's goods industries (N^D_{S1}) in year t is simply the product of the potential output and the reciprocal of the average productivity of skilled labor in each of those sectors $\left(\frac{1}{\alpha_1}\right)$ and $\left(\frac{1}{\alpha_2}\right)$, respectively.

$$N^D_{S1t}=\frac{1}{\alpha_1}\left(X_{1o}+\frac{\lambda}{V_1}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]\right) \quad (10)$$

and

$$N^D_{S2t}=\frac{1}{\alpha_2}\left(X_{2o}+\frac{\phi}{V_2}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]\right) \quad (11)$$

The supply of skilled labor allocated to the producer's goods and consumer's goods industries (N^S_{S1} and N^S_{S2}, respectively) in year t is equal to the product of the supply of skilled labor remaining after the demand of the defense industries is satisfied ($N^S_S-N^S_{SD}$) and each of the civilian industrial sector's share of their combined demand for skilled labor.

$$N^S_{S1t}=(N^S_{St}-N^S_{SDt})\left(\frac{N^D_{S1t}}{N^D_{S1t}+N^D_{S2t}}\right) \quad (12)$$

and

$$N^S_{S2t}=(N^S_{St}-N^S_{SDt})\left(\frac{N^D_{S2t}}{N^D_{S1t}+N^D_{S2t}}\right) \quad (13)$$

If the supply of skilled labor to the two civilian industrial sectors determined in equations 12 and 13 exceed their demand for that input determined in equations 10 and 11, then the actual level of output is equal to the potential level of output. The optimum level of output is assumed to call for the use of inputs in a somewhat fixed proportion and an insufficient supply of skilled labor is assumed to make each unit of capital less efficient. Thus, the marginal productivity of the additional units of capital must be adjusted accordingly [4] and the equations used in the model for determining output in the two civilian industrial sectors show increases in putput as the sum of two quantities: optimum output or investment times the marginal productivity of capital and the reduction in putput due to the shortage of skilled labor or the difference between the demand for skilled labor and the supply of skilled labor times the marginal productivity of skilled labor.

$$X_{1t}=X_{1o}+\frac{\gamma}{V_1}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]-\min.\ \{[-\alpha_1(N^D_{S1t}-N^S_{S1t})],\ 0\} \quad (14)$$

and

$$X_{2t}=X_{2o}+\frac{\phi}{V_2}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]-\min.\ \{[-\alpha_2(N^D_{S2t}-N^S_{S2t})],\ 0\} \quad (15)$$

The total demand for skilled labor (N^D_S) in year t is equal to the sum of the demand for skilled labor in the three industrial sectors which is determined in equations 8, 10, and 11.

$$N^D_{St}=N^D_{SDt}+N^D_{S1t}+N^D_{S2t} \quad (16)$$

The shortage of skilled labor (S_S) in year t is equal to the total demand for skilled labor (N^D_S) determined in equation 16 minus the total supply of skilled labor determined in equation 4.

$$S_{St}=\max.\ \{(N^D_{St}-N^S_{St}),\ 0\} \quad (17)$$

The planners are assumed to determine both the rate of increase in the size of Communist China's defense establishment (m) and its composition (d). The planners' variable m refers to the annual rate of increase in expenditures on increases in the stock of military equipment, and supplies and expenditures for the

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[4] One way to include this inefficiency due to the shortage of skilled labor would be to adopt a general production function in the form, increase in output is equal to ($\alpha-\beta$) times investment; where α is the optimum marginal productivity of capital and β being a direct function of the shortage of skilled labor. This form of representing the production function while more elegant has been rejected merely to simplify the model.

maintenance of military personnel, i.e., the total defense expenditures (D). The planners' variable d refers to the ratio of the annual expenditures for the maintenance of military personnel (G) to the annual total defense expenditures. Both m and d, therefore, would reflect the planners' choice of military strategy. Inasmuch as m is the annual rate of increase in defense expenditures, the value of m can be either positive or negative. The value of d must be greater than zero and less than one.

The annual increase in the stock of military equipment and supplies comes from domestic production of military equipment and supplies (D_x) or from imports (M_D). Given the planners' choice of m and d and their choice of the rate of increase in investment (r) and its allocation to the production of military equipment and supplies (π), necessary imports of military equipment and supplies are determined as a residual. If the necessary imports of military equipment and supplies cannot be obtained from abroad, the planners must reduce m, increase d, or increase π.

Thus, the level of total military expenditures (D) in year t is equal to the level of total military expenditures in the previous year times the quantity $(1+m)$.

$$D_t = D_o(1+m)^t \tag{18}$$

By setting the value for the ratio (d) of the annual expenditures for the maintenance of military personnel (G) to total military expenditures (D), the former expenditures in year t are determined by multiplying the value chosen for d times the total military expenditures in year t which are determined in equation 18.

$$G_t = dD_t \tag{19}$$

Imports of military equipment and supplies (M_D) in year t are equal to total military expenditures (D) minus the sum of the value of domestic production of military equipment and supplies (D_x) and the expenditures for the maintenance of military personnel (G).

$$M_{Dt} = D_t - (D_{xt} + G_t) \tag{20}$$

The total supply of unskilled labor (N^S_B) in year t is determined in equation 5. The total demand for nonagricultural, unskilled labor ($N^D_{\text{non}\,BA}$) in year t is equal to the sum of the demand for unskilled labor in the producer's goods, consumer's goods, and military sectors (N^D_{B1}, N^D_{B2}, and N^D_{BD}, respectively).

$$N^D_{\text{non}\,BAt} = N^D_{B1t} + N^D_{B2t} + N^D_{BDt} \tag{21}$$

In the two civilian industrial sectors, the demand for unskilled labor is equal to the actual output in each sector divided by the average productivity of unskilled labor in each sector (L_1 in the producer's goods sector and L_2 in the consumer's goods sector). The average productivities of both skilled and unskilled labor in all sectors are assumed to be institutional variables, i.e., the values for these variables are determined exogenously; they are taken as given values.

$$N^D_{B1t} = \frac{X_{1t}}{L_1} \tag{22}$$

and

$$N^D_{B2t} = \frac{X_{2t}}{L_2} \tag{23}$$

It is assumed that the industrial and military sectors have first priority in obtaining unskilled labor and, therefore, the supply of this input is equal to the demand for it in the two civilian industrial sectors and in the military sector.

$$N^D_{B1t} = N^S_{B1t} \tag{24}$$

and

$$N^D_{B2t} = N^S_{B2t} \tag{25}$$

and

$$N^D_{BDt} = N^S_{BDt} \tag{26}$$

The demand of the military industries for unskilled labor in year t is equal to the actual output (D_x) divided by the average productivity of unskilled labor (L_D) in those industries. The demand of the armed forces for unskilled labor is equal to the total annual expenditures for the maintenance of military personnel (G) divided by the average expenditures per man (W_G). This average expenditure per man is one of the planner's variables in the model, as is the average wage rate for both skilled and unskilled labor in all sectors, i.e., the planners are assumed to be able to determine the level of real expenditures per capita of the labor force through the control of wages, rationing, and the domestic markets for goods and services.

Thus, the demand for unskilled labor in the defense sector (N^D_{BD}) in year t is equal to the sum of the demand for that type of labor by the military industries and the armed forces.

$$N^D_{BDt}=\frac{D_{xt}}{L_D}+\frac{G_t}{W_G} \tag{27}$$

With the total supply of unskilled labor determined in equation 5 and the total nonagricultural demand (i.e., supply) determined in equation 21, the supply of unskilled labor assigned to the agricultural sector (N^S_{BA}) in year t is equal to the former quantity (N^S_B) minus the latter quantity $N^D_{\text{non } BAt}$.

$$N^S_{BAt}=N^S_{Bt}-N^D_{\text{non } BAt} \tag{28}$$

In other words, it is assumed that all labor not employed in the nonagricultural sectors is allocated to the agricultural sector whether there exists the demand for those laborers or not. Inasmuch as there is no substitution between unskilled labor and capital in the production functions included in the model, the potential output of the agricultural sector is solely determined by the amount of fixed capital in that sector, i.e., by the first term in equation 7.

$$\text{Potential output in agriculture}=A_o+\frac{e\lambda}{V_A}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]$$

The demand for unskilled labor in the agricultural sector (N^D_{BA}) in year t is equal to this potential output divided by the average productivity of unskilled labor in agriculture (L_A).

$$N^D_{BAt}=\frac{A_o+\frac{e\lambda}{V_A}I_{xo}\left[\frac{(1+r)^{t+1}-(1+r)}{r}\right]}{L_A} \tag{29}$$

The surplus of unskilled labor (S_B) in the agricultural sector in year t is equal to the total supply of unskilled labor in that sector (N^S_{BA}) minus the total demand for unskilled labor in that sector (N^D_{BA}).

$$S_{Bt}=N^S_{BAt}-N^D_{BAt} \tag{30}$$

If the resulting difference has a positive sign, there is a surplus and the excess supply is absorbed in the agricultural sector with no increase in agricultural production; actual output is equal to potential output and the marginal productivity of unskilled labor is equal to zero. If the resulting difference has a negative sign, there is a deficit and the actual level of output in the agricultural sector is determined by the available supply of unskilled labor in agriculture (N^S_{BAt}) times the average productivity of unskilled labor in that sector (L_A), i.e., the actual level of output is determined by the second term in equation 7. When there exists a shortage of unskilled labor in agriculture, producer's goods will have a marginal productivity of zero—be in excess supply—and the marginal productivity of unskilled labor will be equal to its average productivity (L_A).

The annual weighted-average real wage of unskilled labor in all nonagricultural sectors (W_1, W_2, W_D, W_G, in the producer's goods, consumer's goods, and military industries and in the armed forces, respectively) and of skilled labor in all sectors (W_S) is assumed to be determined by the planners. In this version of the model, the real wage of the unskilled labor employed (i.e., demanded or N^D_{BA}) in agriculture (W_A) also is assumed to be a planner's variable. In some of the alternative versions of the model, the consumption of the agricultural labor force is the residual variable which serves to equate the total supply and demand for resources in the economy. In those alternative versions of the model, the annual weighted-average real wage of unskilled labor in the agricultural sector becomes one of the dependent variables. These annual weighted-average real wage rates are assumed to include both private disposable income and commodities and services provided by the state for public consumption. It is assumed that all income received by labor, both skilled and unskilled, is used entirely for the consumption of agricultural products (C_A) and consumer's goods (C_{x2}).

Although the annual weighted-average wage rates are planner's variables, the proportion of total consumption consisting of agricultural products (a) is assumed to be an institutional variable.

With the exception of the agricultural sector, per capita consumption in each of the sectors is equal to the annual weighted-average real wage per worker divided by the number of dependents per worker. In the agricultural sector, the employed unskilled laborers are assumed to share their consumption (wages) not only with their dependents, but also with the unemployed laborers and their dependents in that sector. Inasmuch as all unemployed labor is assumed to be restricted to the agricultural sector and the annual weighted-average real wage of labor is assumed to be lower than the real wages in other sectors, the lowest level of per capita consumption in the economy will be in agriculture.

The planners are assumed to be free to choose the values for the planner's variables in the model, but are free only within certain limits. The most significant limit to their freedom is the limit to the available supplies of capital and labor. Another important limit is their inability to starve the Chinese people, i.e., the need to maintain a minimum level of per capita consumption. In the model, the lowest level of per capita consumption shows up in the value for the per capita consumption of the agricultural labor force(s).

Total consumption (C) in year t is simply the sum of all real income received by employed labor in the economy or the sum of the total employment of skilled labor times the annual weighted-average real wage for skilled labor, the total employment fo unskilled labor employed in each sector times the annual weighted-average real wage of unskilled labor in each sector, and the share of total expenditures for the maintenance of the armed forces spent on the consumption of agricultural products and consumer's goods (b). This proportion of total expenditures for the maintenance of the armed forces spent on agricultural products and consumer's goods (b) is assumed to be an institutional variable. In the agricultural sector, the total consumption of the agricultural labor force is equal to the total demand for unskilled labor in that sector (N^D_{BA}) times the annual weighted average real wage of unskilled labor in agriculture and this total consumption is divided up among the total supply of unskilled labor in agriculture (N^S_{BA}) to determine the standard of living of the labor force in that sector.

Thus, the four equations in the consumption sector determine total consumption (C) in year t, the division of consumption expenditures between those on agricultural products (C_A) and those on industrially produced consumer's goods (Cx_2), and the standard of living of the agricultural labor force(s).

$$C_t = W_S N^S_{St} + W_D \left(\frac{D_{xt}}{L_D}\right) + bG_t + W_1 N^D_{B1t} + W_2 N^D_{B2t} + W_A N^D_{BAt} \tag{31}$$

and

$$C_{At} = aC_t \tag{32}$$

and

$$C_{X2t} = (1-a)C_t \tag{33}$$

and

$$s_t = \frac{W_A N^D_{BAt}}{N^S_{BAt}} \tag{34}$$

In the foreign trade sector, exports (E) in year t are assumed to consist of agricultural products and consumer's goods. The available supply of agricultural products for export is determined by subtracting the consumption of agricultural products by the domestic population (C_A) and the inputs of agricultural products in the industrial production of consumer's goods (RX_2) from the total output of agricultural products (A). The amount of agricultural products required as inputs per unit consumer's goods output (R) is assumed to be an institutional variable as are all the input-output relationships in the model. The supply of consumer's goods available for export is equal to the total value of consumer's goods produced (X_2) minus the domestic consumption of consumer's goods (C_{X2}).

$$E_t=(A_t-C_{At}-RX_{2t})+(X_{2t}-C_{X2t})$$

or

$$E_t=A_t+(1-R)X_{2t}-C_t \tag{35}$$

Imports (M) in year t are assumed to consist of the producer's goods imports (M_I) determined in equation 2 and the imports of military equipment and supplies (M_D) determined in equation 20.[5]

$$M_t=M_{It}+M_{Dt} \tag{36}$$

Foreign borrowing (F) in year t is equal to total imports (M) minus total exports (E).

$$F_t=M_t-E_t \tag{37}$$[6]

The monetary value of all variables in the model are given in terms of base year prices and, thus, all changes expressed in monetary values indicate changes in real quantities. The value of exports and imports are also expressed in terms of constant prices and, therefore, the assumption is made that both the elasticity of supply for China's import commodities and the elasticity of demand for China's export commodities are infinite at the existing constant prices.[7] The same assumption is made concerning domestic intersectoral trade. In fact, in order to keep the model as simple as possible, intersectoral trade does not constitute a separate sector of the model. Rather, the required net transfer of agricultural products to other sectors is not achieved by changes in the terms of trade, but by taxes in kind and forced deliveries to the state. With prices fixed, a given amount of agricultural products is assumed to be supplied to the industrial sector in exchange for an equal value of industrially produced consumer's goods which are consumed in the agricultural sector. The nonagricultural sector's additional demand for agricultural products for consumption, inputs in production, and export is assumed to be supplied to these sectors at fixed prices by the state; the state having acquired the agricultural products by taxes in kind and forced deliveries levied on the agricultural sector. The exclusion from the model of the monetary and domestic trade sectors, however, greatly simplifies the model and would appear to serve its purpose as a simplifying assumption for a model of an economy in which there is a relatively strong degree of state control over prices and the allocation of consumer's goods.

The amount of agricultural products obtained from the agricultural sector by the state (T_{AX}) in year t is equal to the total output of agricultural products (A) minus the total consumption of the agricultural labor force; their consumption of industrially produced consumer's goods as well as their consumption of agricultural products.

$$T_{AXt}=A_t-a(W_AN^D_{BAt})-(1-a)\ (W_AN^D_{BAt})$$

or

$$T_{AXt}=A_t-W_AN^D_{BAt} \tag{38}$$

[5] In this version of the model there are no imports of consumer's goods (M_C). When the per capita consumption of the agricultural labor force(s) is reduced to the minimum level acceptable to the planners, it becomes necessary to maintain that standard by reducing exports, i.e., by reducing the "net" export of consumer's goods either by means of reducing the level of agricultural products and consumer's goods exported or by importing those goods. In the early 1960's, China's imports of grain became an important aspect of China's foreign trade and rather than hide this significant development as a reduction in "net" exports, a version of the model has been developed to explicitly include imports of consumer's goods (M_C).

[6] In the version of the model presented here, the foreign trade sector is the residual, balancing sector, and the required foreign aid and loans to finance the gap between total supply and total demand for resources in the domestic economy are assumed to be available. If these are not available, and a particular export surplus or a balanced trade is required, the alternative version of the model in which the consumption sector is the residual, balancing sector, becomes the appropriate version to use. When the consumption sector becomes the residual, balancing sector, however, the planner's lose one degree of freedom. The planners must increase exports by reducing wages and, thus, domestic consumption or by allowing money wages to remain fixed while reducing consumption by means of rationing or they must reduce their demand for imports. The latter policy would mean that exports are still determined as a residual—the difference between the domestic supply and demand of agricultural products and consumer's goods, but the resulting level of exports and required balance of trade determine the required level of imports. With a given level of imports available to the planners, their selection of a value for two of the three planner's variables r, m, or d would determine the value of the third.

The version of the model presented in this appendix has been chosen for presentation merely because it is the simplest of the several versions of the model used.

[7] In other words, as indicated above, China's balance of payments is assumed to be balanced by adjustments in the flow of commodities or capital movements, not by changes in prices or the exchange rate.

The consumption of industrially produced consumer's goods by the agricultural labor force, as well as the agricultural products they consume, is subtracted from total agricultural production to determine effective state levies on the agricultural sector inasmuch as it is assumed the agricultural sector has obtained these consumer's goods by voluntarily trading an equivalent amount of agricultural products with the consumer's goods sector. Thus, the total amount of agricultural products obtained from the agricultural sector by the state is equal to total output minus total consumption in that sector and the effective rate of taxation in the agricultural sector (t) in year t is equal to the total amount of agricultural products obtained by the state divided by the total output of the agricultural sector.

$$t = \frac{T_{AX\,t}}{A_t} \tag{39}$$

The projection model specified above consists of 39 independent structural equations and contains 39 endogenous or dependent variables. Given the values chosen for the 13 planner's variables, those determined for the 17 institutional variables, and those chosen for 8 of the endogenous variables in the base year, the values for the 39 endogenous variables can be determined for any future year.

Part V. COMMERCIAL RELATIONS

THE SINO-AMERICAN COMMERCIAL RELATIONSHIP

By William Clarke *and* Martha Avery*

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Appendixes

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A. Overview

The visit of President Nixon to the People's Republic of China (PRC) in February 1972 and the resultant Shanghai Communique signaled the resumption of the Sino-American relationship dormant since Chinese troops had entered North Korea 22 years earlier. The historic relationship, sometimes unequal, had begun in 1784 with the call at Canton of the American vessel, *Empress of China*. Commencing in 1969 with the easing of travel and trade restrictions, the United States had indicated a desire to change its policy toward the PRC; the Shanghai Communique of February 1972 is the official expression of that change.

About commercial relations the joint communique said:

> Both sides view bilateral trade as another area from which mutual benefits can be derived, and agree that economic relations based on equality and mutual benefit are in the interest of the peoples of the two countries.

It was agreed that the progressive development of trade between the two countries would be facilitated.

The policy enunciated in the Shanghai Communique has been reaffirmed by both sides on various occasions, especially during Secretary Kissinger's several trips to Peking. And, it has been reaffirmed by actual results in the commercial sector. Trade, which had been nonexistent in 1970, rose to $805.1 and $933.8 million by 1973 and 1974, respectively, with wheat sales, jet transport exports, and a number of other major contracts highlighting this unexpectedly rapid development. On the strength of Chinese purchases of American agricultural commodities, the United States has risen to the position of China's No. 2 trading partner in the last 2 years. A degree of normalization has been returned to the Sino-American commercial relationship.

While trade has risen quickly to significant levels, while more and more American businessmen are traveling to Peking and to the Canton Trade Fair, and while liaison offices with commercial staffs have been opened in the respective capitals, certain unresolved issues clearly stand in the path of substantial further improvement in trading relations. Coupled with these commercial issues are some of the usual business problems occurring between trading partners everywhere, as well as some peculiar to United States-China trade. Resolution of the outstanding commercial issues will require negotiations between the two governments.

Settlement of the issues of Chinese blocked assets and United States private claims would clear the way for further normalization of commercial relations. Unresolved, these issues prevent direct shipping and direct airline connections owing to the risk of attachment of flag carriers in satisfaction of claims. Direct banking is precluded and the exchange of trade exhibitions forestalled. Another major commercial issue concerns the extension by the United States of most-favored-nation (MFN) nondiscriminatory tariff treatment to the PRC. PRC officials have raised the MFN issue with U.S. businessmen and others. Presumably, Peking not only wants MFN, but feels entitled to it as part of the Shanghai commitment to conduct trade on the basis of "equality and mutual benefit." The Trade Act of 1974 provides a mechanism by which the United States could confer MFN status on China, but it is an act burdened with difficult requirements where the nonmarket economies of the socialist states are concerned.

The facilitation of business continues with the National Council for United States-China Trade (National Council) and others providing substantial assistance to American importers and exporters. Analysis of commodities now moving in Sino-American trade suggests that there is sufficient growth potential in nonagricultural raw and semifinished materials and in advanced plant, equipment, and technology to warrant optimism in the future vitality of this commerce even though total trade turnover in 1975 will decline sharply owing to a steep drop in Chinese purchases of American agricultural products. Chinese foreign trade policy, while rooted in absolute control over all of the instrumentalities of trade and in the Chinese dictum of "self-reliance," explicity provides for the importation of foreign goods and technology. Thus, the prognosis for further improvement in business relations and in the growth of trade in the near future is favorable.

Although there is improvement in the business climate, significant progress in the normalization of commercial relations is now dependent on resolving some of the key commercial issues. It is likely that considerable time would be required for these negotiations and, thus, it is not possible now to predict when they might be resolved by Washington and Peking.

In the interim American business interests would do well to try to better understand the PRC and its trading institutions and practices so different from our own and those encountered elsewhere in market economies. It is worth reminding ourselves that of the principal nations of the world probably none is closer to economic self-sufficiency than China. The PRC is not a market for 50 million American automobiles or refrigerators, but a highly selective one entirely dependent on the dictates of Peking's planning. To be successful, and there are successful American businessmen in the China trade, one requires large amounts of patience and a fine appreciation of Chinese decision-making and commercial practice.

B. Commercial Relations: Historical

The U.S. commercial relationship with China began in 1784, when the *Empress of China* called at Canton to unload a cargo of ginseng. Following in the wake of the flourishing Sino-British trade conducted by the East India Co., the United States reaped the benefits of England's "gunboat diplomacy," sending millions of dollars worth of silver to China during the 19th century for the purchase of Chinese tea and silk. The British had initiated trade in Canton by attacking the city with warships. In a determined fight against the Emperor's restrictive policies, the British pried the door open for all those who wished to trade with the Middle Kingdom.

Earlier, in 1702, in response to the increasing nuisance of trading with foreigners, China had begun the Co-Hong or Factory system. By this arrangement direct contact with foreigners was limited to the sole agent at Canton and Amoy through whom foreigners had to buy and sell. In 1757 Canton was designated the only port at which foreigners could trade; the increased volume of trade there was handled by an expanding Co-Hong system. Officially 13 in number, the Co-Hongs had become corporate bodies given an absolute monopoly on all dealings with foreigners.

Opium War

By the early 1800's, England was no longer satisfied with the restrictive Co-Hong system, and in 1839, incensed at the confiscation of opium, the English retaliated with armed force. Opium had been used as the chief financial means to offset Britain's imports from China, and constituted some 40 to 50 percent of China's imports. Enraged at its deleterious effects on both health and the outflow of silver, the Manchu Government had issued several edicts prohibiting its sale and had forced British traders to turn over opium to be burned. The ensuing struggle, known as the Opium War, resulted in the Treaty of Nanking of 1842 and substantially altered the Chinese structure for international trade. The Co-Hong system was abolished and five treaty ports were established as centers of trade: Shanghai, Canton, Ningpo, Foochow, and Amoy. Hong Kong was ceded to Britain as a free port, and China was required to pay $6 million for the confiscated opium. Two years later, China was also deprived of the right to fix customs duties, and a flat rate of 5 percent by value was imposed on all imports.

During the next 70 years, over 50 commercial treaties and their amendments, including numerous unequal terms and clauses, were imposed on China. Extraterritorial rights allowed foreigners freedom from prosecution under Chinese law, internal waterways were opened to all vessels under foreign flag, and the "transit pass system" allowed cheap transport of foreign goods inside the country. The Treaty of Tientsin in 1858 specifically legalized traffic in opium. Following the 1895 war with Japan, the Treaty of Shimonoseki allowed construction of foreign factories in all treaty ports, 48 of which had been opened since 1842. This era of China's history has been aptly called a period of submission and subjection.

Early 20th Century Trade

American participation in the "partitioning" of China was minimal, but the United States did acquiesce in the division of China into "spheres of influence." In 1899 the United States promulgated an Open Door Policy which stipulated that all nations be given equal rights in China, that none be denied the privileges of commerce and navigation extended to any one country. Until the end of the 19th century, Britain had commanded the substantial portion of China's foreign trade, feeding the China market with cotton goods from Lancashire and yarn and opium from India. The United States share of this market was not insignificant, however. In 1868, 9.5 percent of China's exports went to the United States, and Sino-American trade constituted 5.2 percent of China's total trade. By 1905 trade turnover had reached $81 million annually.

The years following enunciation of the Open Door Policy saw a progressive, but very gradual growth in the level of United States-China trade. In 1912 the United States was China's fourth largest trading partner, by 1919 the third, and by 1931 the United States had replaced Hong Kong as China's second largest trading partner, accounting for 19 percent of China's total trade. World War I brought a sudden shipping shortage and, consequently, soaring freight charges which acted as a very effective import duty, spurring the development of industries and resources in China and lending impetus to manufacturing there. The wealth of raw materials, cheap labor, and supranational treatment of foreigners contributed to extensive foreign investment. To facilitate the expansion of United States-China trade, Congress passed the China Trade Act in 1922, authorizing the creation of corporations for the purpose of doing business with China. Firms incorporated under the act were entitled to certain tax relief benefits. To qualify for incorporation, a company had to be organized to do business within China (since 1950, within Hong Kong or Taiwan), and had to contribute to the development of demand in China for goods produced in the United States.

Prior to World War I, China's principal exports were silk and tea, constituting 92 percent of China's total exports in 1871 and 50 percent in 1898. With the development of the Indian and Japanese tea industries, competition cut into China's tea trade, while silk took its place beside a range of new exports including soybeans from Manchuria, ginned cotton, eggs and egg products, and bean oil. As the commodity market changed, and foreign investments aided growth of the domestic textile industry, China's imports of cotton cloth goods declined until they held only 1.7 percent of total imports in 1936. To supply these new domestic mills, however, China became a significant importer of raw cotton. From 1920 on, more raw cotton was imported than exported and in 1931, this commodity alone constituted 32.5 percent of China's total imports from the United States.

Other major American exports included kerosene oil, softwood logs, steel, and tobacco. By 1927, China relied on the United States for 80.8 percent of its tobacco, 74.5 percent of its oil and kerosene, and 63.2 percent of its timber. Prior to World War II, China's No. 1 export to the United States was raw silk, constituting a third of total U.S. imports from China. A large percentage of China's fur skins, gum rosin, bristles, tea, and wool also went into the United States. In the peak years between 1920 and 1929, trade turnover between the two countries ran between $209 and $339 million, annually.

In contrast to the trade deficits run up with other trading partners, China's trade balance with the United States remained positive throughout the 1920's, declining only from 1931–34, when China's exports to the United States declined faster than her imports. By 1935–36 the balance was again favorable to China, with exports exceeding imports by $26–$27 million. From 1911 to 1949, China's total foreign trade with most countries was marked by chronic deficits.

During the Sino-Japanese War, China's increase in government expenditures, combined with a decrease in revenue due to the loss of the coastal cities resulted in rampant inflation. Between 1941 and 1945 inflation ran 300 percent a year and from 1946–48, it was 600 percent a year. After 8 years of war with Japan and 3 years of intense civil conflict, China's foreign trade was almost totally disrupted, although U.S. exports to China during 1946–48 were higher than ever as recovery from the ravages of war was begun. Table 1 shows United States-China trade for the period 1900–53 after which all trade halted.

TABLE 1.—UNITED STATES-CHINA TRADE, 1900–53

[In millions of U.S. dollars]

Year	U.S. exports	U.S. imports	Total
1900	15	27	42
1901	10	18	28
1902	25	21	46
1903	19	27	46
1904	13	29	42
1905	53	28	81
1906	44	29	73
1907	26	33	59
1908	22	26	48
1909	19	29	43
1910	16	30	46
1911	19	34	53
1912	24	30	54
1913	21	39	60
1914	25	39	64
1915	16	40	56
1916	32	80	112
1917	40	125	165
1918	53	111	164
1919	106	154	260
1920	146	193	339
1921	108	101	209
1922	100	135	235
1923	109	188	297
1924	109	118	227
1925	94	169	263
1926	110	143	253
1927	83	152	235
1928	138	140	278
1929	124	166	290
1930	90	101	191
1931	98	67	165
1932	56	26	82
1933	52	38	90
1934	69	44	113
1935	38	64	102
1936	47	74	121
1937	50	104	154
1938	35	47	82
1939	56	62	118
1940	78	93	171
1941	95	87	182
1942	80	16	96
1943	53	12	65
1944	52	11	63
1945	108	6	114
1946	465	93	558
1947	353	117	470
1948	273	120	393
1949	83	107	190
1950	45	146	191
1951	0	46	46
1952	0	28	28
1953	0	1	1

Source: U.S. Department of Commerce, Historical Statistics of the United States: Colonial Times to 1937, and Supplements, Washington: Government Printing Office, 1960.

Initial PRC Relations

During 1950, the first full year of the People's Republic of China, two-way trade totaled $191 million with China exporting almost three times as much as she imported; the U.S. share of China's total trade was 22.5 percent in that year. Trade dropped precipitously in 1951, however, as a result of the Korean War. When Chinese troops entered that conflict, President Truman declared a national emergency on December 14, 1950. Acting under authority of section 5(b) of the Trading with the Enemy Act of 1917, the Secretary of the Treasury issued the Foreign Assets Control Regulations on December 17, 1950. At the same time the Department of Commerce embargoed all American exports to China under authority of the Export Control Act of

1949. These actions immediately eliminated all U.S. exports to China. Pursuant to the Defense Production Act of 1950 the Department of Commerce issued Transportation Orders T-1 and T-2 which prohibited U.S. carriers from calling at the PRC and prohibited all U.S.-flag air or sea carriers from transporting or loading any cargo ultimately destined for the PRC. Bunkering of vessels calling or having called at Chinese ports was also prohibited. Shortly after the U.S. actions, by a decree of December 29, 1950, the PRC assumed control over all U.S. property in China.

On these somber notes, all relations between the two countries came to a virtual standstill although some Chinese imports continued to reach the United States until 1953.

C. Commercial Relations: Restored

American Initiatives

By 1969 an ever larger number of Americans both in and out of government recognized the growing desirability of normalizing relations with the PRC. Greater world recognition of China's place was clearly evidenced by closer UN votes on the admission of the PRC. The increasingly pragmatic foreign policy and foreign trade policy practiced by the Chinese did much to foster such attitudes.

In a move implementing the Administration's decision to initiate a relaxation of tensions and to facilitate the development of peaceful contacts with China, the U.S. announced on July 21, 1969 that American tourists and American residents abroad would be permitted to purchase up to $100 worth of goods originating in the PRC. Six categories of U.S. citizens would have passports automatically validated for travel to China: members of Congress, journalists, professional teachers, scholars with post graduate degrees and students in colleges and universities, scientists and medical doctors, and American Red Cross representatives.

In a further step, the United States announced on December 9, 1969, that commercial regulations affecting trade with PRC would be relaxed to permit foreign subsidiaries and affiliates of American firms to trade in nonstrategic goods with China. The requirement that U.S. firms or banks engaged in third-country trade obtain certificates of origin where goods or commodities are of "presumptive Chinese origin" was eliminated, although such goods would still require origin certificates on goods for shipment to the United States.

The $100 limit was removed on purchases of Chinese goods by Americans for noncommercial use and the requirement to limit such imports to "accompanied baggage" was dropped. At the time, the U.S. announcement said the changes in commercial regulations complemented the political desire to improve relations with China. Commencing in August, the bunkering of free world ships carrying nonstrategic goods to the PRC with petroleum products of non-U.S. origin was allowed.

On March 16, 1970, the United States commenced validation of American passports for travel to the PRC for any legitimate reason. In April, the President authorized shipment of American-made components in nonstrategic, foreign-manufactured goods. In the first significant transaction following this relaxation the U.S. Government, in July 1970, authorized the use of General Motors' engines in trucks built by Perlini of Italy for export to China. Commencing in August, the bunkering of free world ships carrying nonstrategic goods to the PRC with petroleum products of non-U.S. origin was allowed. At the end of 1970 in a policy statement, President Nixon said on December 10:

> We are going to continue the initiative that I have begun—an initiative of relaxing trade and travel restrictions and attempting to open channels of communication with the People's Republic of China.

The Department of State announced the removal of all restrictions on travel by Americans to China on March 15, 1971. The first signal that Peking recognized the U.S. initiatives came on April 7, 1971, when Peking invited the American table tennis team to visit China.

End of the Embargo

On April 14, 1971, the President announced his intention of relaxing the 21-year-old embargo, saying that he had asked for a list of items of a nonstrategic nature which could be placed under general license for direct export to China; he also requested other changes in regulations affecting trade.

In a variety of regulatory changes in response to the President's April request, the Treasury Department on May 7, 1971, announced the issuance of a general license removing all controls on the use of dollars or dollar instrumentalities in transactions with the PRC and its nationals. These changes did not pertain to the blocked Chinese assets. The Treasury's Foreign Assets Control Regulations were amended to remove prohibition against American-controlled, foreign-flag vessels calling at PRC ports. U.S. oil companies abroad were now authorized to sell fuel to or bunker vessels owned or controlled by the PRC, except vessels going to or from North Korea, North Vietnam, or Cuba.

A joint Department of Transportation and Department of Commerce release of May 7 modified Transportation Order T-2 to permit U.S. carriers to transport commodities authorized for consignment to the PRC to non-PRC ports.

On June 10, 1971 the President announced, as one of the first broad steps in the termination of the embargo to the PRC, a long list of nonstrategic U.S. commodities that might be exported to China under general license, that is, without specific authorization from the Department of Commerce. The list included: most farm, fish, and forestry products; tobacco; fertilizers; coal; selected chemicals; rubber; textiles; certain metals; agricultural, industrial, and office equipment; household appliances; electrical apparatus in general industrial or commercial use; certain electronic and communications equipment; certain automotive and consumer goods. Commodities not on this list would be considered for specific licensing consistent with U.S. national security requirements. The same action modified the Foreign Assets Control Regulations to permit imports from the PRC to enter under general license, subject to the tariff rates generally applicable to goods from most Communist countries. Regulations against the import of the seven fur skins prohibited entry by the Trade Agreements Extension Act of 1951 were not changed, however.

On July 15, 1971, President Nixon announced plans to visit China at a date prior to May 1972. On October 25, 1971 the United Nations voted to seat the People's Republic of China.

In a major series of changes affecting trade, the President announced on February 14, 1972, on the eve of his departure for China, a decision to accord the PRC for export control purposes the same treatment applicable to the U.S.S.R. and certain East European countries. The same action also removed U.S. controls on the export to the PRC of foreign products manufactured with technical data of U.S.-origin to the same level.

On February 14, it was also announced that the President had directed further changes in the Foreign Assets Control Regulations to China. The regulation requiring U.S.-controlled firms in COCOM countries (the NATO countries, minus Iceland, plus Japan) to obtain a Treasury license, in addition to a host country license, for the export of strategic goods to the PRC was removed. Also eliminated was a similar requirement that U.S.-controlled firms abroad obtain prior Treasury licenses for the export of foreign technology to the PRC.

The Shanghai Communique

The visit of President Nixon to Peking in February 1972 and the Shanghai Communique issued at the conclusion of the visit on February 28 visibly demonstrated that initiatives by the United States in 1969, 1970, and 1971 to begin the process of normalizing relations had produced concrete results. The Shanghai Communique remains the foundation of U.S. policy toward the PRC today (full text at end of article).

Regarding commercial relations the Communique said:

> Both sides view bilateral trade as another area from which mutual benefits can be derived, and agree that economic relations based on equality and mutual benefit are in the interest of the peoples of the two countries. They agree to facilitate the progressive development of trade between the two countries.

Attendance by Americans at the Chinese Export Commodities Fair in Canton in the spring and fall of 1972 was tangible evidence of the evolving commercial relationship. A significant amount of trade during 1972, discussed in section E, was further evidence of the sincere desire of both the United States and China to give substance to the renewed relationship.

On November 22, 1972, the Transportation Order T–2 was further modified to permit U.S. air carriers and ships to visit PRC ports.

Another substantial advance in normalizing relations occurred at the time of Mr. Kissinger's visit to Peking in February 1973. The two countries agreed to accelerate the pace of normalization and to broaden contacts in all fields, including trade (joint communique of February 28 at end of article). To facilitate this process each side agreed to establish a "Liaison Office" in the capital of the other.

By June 1, 1973, both the U.S. Liaison Office in Peking and the PRC Liaison Office in Washington had opened for business. Performing most functions of an embassy, both Liaison Offices contain commercial officers to assist businessmen and promote trade. Since opening in 1973, commercial staffs in both offices have been enlarged.

In yet another step designed to encourage commercial relations between the two countries, the wholly private National Council for U.S.-

China Trade was created on March 22, 1973 with the encouragement of the White House and the Departments of State and Commerce, and with the cooperation of the PRC Liaison Office.

During the balance of 1973 and 1974, continued improvement in commercial relations was marked by rising trade, by visits of more and more American businessmen to China, both to the Canton Fair and to the foreign trade corporation offices in Peking, and by visits of a few Chinese groups, usually for training purposes to plants of American firms with which they had contracts. In one case, a Chinese commercial group visited U.S. plants to survey prospects for buying plant and equipment. The journey of the National Council to China in November 1973 marked the first visit of a broadly based, commercially oriented American group to China in more than 20 years. Further commercial exchanges occurred in 1975 with the visit to the United States of a textile study group in February and March 1975, and a visit to the PRC by a San Francisco Chamber of Commerce mission in May; several other exchanges are scheduled. There have been no exchanges of trade exhibitions.

Secretary of State Kissinger made another trip to Peking in November 1974. Both sides reaffirmed the principles of the Shanghai Communique, and announced that President Ford would visit the PRC in 1975 (joint communique of November 29 at end of article).

While United States-China trade will be off in 1975 owing to the steep decline in agricultural purchases by the Chinese, the commercial relationship, adhering to the principles of the Shanghai Communique, has made notable advances in the 3 years since President Nixon's visit.

D. Chinese Foreign Trade Policy

From the Chinese viewpoint, trade during the 150 years prior to the Revolution had been imposed on China by foreign nations through armed force and unequal treaties. Foreign traders, with support from their governments, dumped goods in China, unfairly seized Chinese industrial materials, and exported capital from China. China's important trading ports, customs, finance, insurance, and navigation were dominated by foreigners. Frustration over the prolonged political interference and economic exploitation resulted in many abortive attempts to remove the foreign presence. Trade was seen by the Chinese as a key element by which foreigners controlled their country.

It is not surprising, therefore, to find Mao Tse-tung saying on the eve of the Revolution that "the restoration and development of the national economy of the people's republic would be impossible without a policy of controlling foreign trade." The implication here that restoration of the economy could not be achieved without foreign trade is worth noting. After its founding in 1949, the PRC pursued a policy of total state control over all instrumentalities of foreign trade. State-owned foreign trade corporations were established and a series of measures adopted to handle the import and export of various commodities, the issuance of import and export permits, the settlement of tariffs, the prohibition of smuggling, control over foreign exchange, the inspection and testing of imports and exports, and the registration of foreign traders and rules for them to follow.

Central Themes

Running consistently through Chinese foreign trade policy are two central themes: (1) Self-reliance, and (2) trade on the basis of equality and mutual benefit. In the first, Peking sees a means of preserving independence by reducing reliance on foreign assistance and by limiting the foreign presence in China. In the second Peking sees a way to supplement China's own resources without risk of entanglement while creating a useful channel for promoting understanding of Chinese socialism and other diplomatic objectives. On the basis of these policies, the PRC is currently trading with over 150 countries and has signed trade agreements with more than 50 countries.

In well-known statements, Chairman Mao has said "we must build China into a socialist country with modern industry, agriculture, science and technology, and defense," and "we must build our country independently and with the initiative in our hands through self-reliance, hard struggle, diligence, and thrift." Reiteration of the themes is frequent. Deputy Premier Teng Hsaio-ping explained to the United Nations in April 1974:

> By self-reliance we mean that a country should mainly rely on the strength and wisdom of its own people, control its own economic lifelines, make full use of its own resources, strive hard to increase food production and develop its national econmy step by step in a planned way.

On the theme of equality and mutual benefit, Minister of Foreign Trade, Li Chiang, recently wrote:

> China has opened up trade with other countries in a planned way, on the basis of equality and mutual benefit, to learn from other countries' merits and to obtain necessary materials, equipment, and technology through exchange. This is putting into practice the principle of making foreign things serve China, and combining learning with inventing in order to increase her ability to build socialism independently, with her own initiative and relying on herself to speed up socialist construction.

Conflict in Policy

The two themes of self-reliance and trade on the basis of equality and mutual benefit may appear to conflict, since to some self-reliance means independence from outside assistance while imports of equipment and technology appear to be a form of that assistance. Actually, the debate in China on this matter predates the Revolution and since 1949 has sharpened on various occasions. At such times as the imposition of the U.S. embargo in 1950 and the Soviet withdrawal of aid in 1960 impetus has been given those favoring a greater degree of self-reliance and reaction has manifested itself by the rapid repayment of the debt to the U.S.S.R., in opposition to foreign imports, and in other ways. The argument for sharply restricting the importation of foreign plant, equipment, and technology has been seen and heard in the Great Leap Forward, in the Cultural Revolution, in the Anti-Lin Piao Anti-Confucius campaign and elsewhere. For example, consider this statement from a January 1974 issue of China's leading theoretical, political, and economic journal:

> We cannot pin the hope (of developing Chinese industry) on others, still less can we pin the hope on large scale importation of techniques and equipment from Capitalist countries * * * To develop industry by depending on importation of foreign techniques and equipment not only is not a shortcut, but is a tortuous,

evil path. The idea of taking shortcuts is actually an expression of the world outlook of the lazy man and coward.

There have been swings in foreign trade policy toward more sharply restricted imports, for example, almost no foreign plants were imported between 1966 and 1971. Recently, however, those in Peking responsible for the economy have appeared to favor a pragmatic combination of being both self-reliant and of importing needed plant, technology, and other commodities. In a recent publication, the head of the Chinese Council for the Promotion of International Trade (CCPIT) actually linked technological imports with self-reliance when he said:

> China imports some new equipment and technology that are needed in carrying out the policy of being more self-reliant and speeding up the building of socialism.

The reality of this statement is best seen in the massive purchase by the Chinese over the past 2 years of over $2 billion in complete plant and associated technology and more if individual items of equipment are added.

Financial Policy

The international financial policy of China is conservative and attempts are made to finance imports with export earnings; China trades on a multilateral basis and generally does not press to balance its trade with individual countries.[1] The balance of payments has been favorable in most years with imports, foreign aid expenditures, and debt repayments more than compensated for by export earnings, overseas remittances, and receipts of foreign credits. Since liquidation of the Soviet debt in 1965, the PRC has avoided long-term credit. Short-term credits and deferred payments (medium-term credit) have been extended to China for purchases of grain, steel products, fertilizer, and complete plants.

With larger than normal agricultural purchases in 1973–74 and with the recent large purchases of plant and technology on deferred payments, China's external indebtedness, although well within the PRC's financial capability, has been rising. At the end of 1974, China appeared to be suffering from a shortage of foreign exchange brought on by massive purchases of plant and equipment and by a softening world market for Chinese exports and increased prices for imports. Deliveries under contracts for agricultural products, fertilizer, iron and steel, and other commodities were deferred and in some cases contracts were canceled. Such a shortage seems temporary as the potential for significant earnings from exports of crude oil appears excellent.

E. The New Trade

By international standards China is not a major trading nation. Total trade of the PRC in 1974 was about 6 pecent that of the United States and about on a level with Brazil. Also, total Chinese trade is a relatively small share of its gross national product, about 5 to 6 percent in 1974. This is not surprising for a large country with a huge population, a planned economy, major internal markets, and low per capita income.

[1] For more detail on financial aspects of Chinese trade, see David Denny elsewhere in this report.

For 1974, China'a total foreign trade is estimated to have been $13.-715 billion, an all-time high, and an increase of around 39 percent over 1973 in current prices. [2] Because of worldwide inflation the increase may have been very small, if at all, in real terms. As in 1973, imports outpaced exports and for the second year running the PRC incurred at trade deficit; about $1.1 billion in 1974.

Trade Statistics

In the short span of several years, United States-China trade has grown from zero to nearly a billion dollars, substantially exceeding most predictions made at the time of the President's visit or earlier. In 1973 and 1974, the United States was China's No. 2 trading partner following Japan. In 1974, China ranked second among the socialist states in trading with the United States, closely following the U.S.S.R.; Soviet-American trade turnover was $958 million. Total United States-China trade since the resumption of relations is shown in table 2. The table also shows imports and exports during the same period and contains an estimate for 1975.

TABLE 2.—UNITED STATES-PEOPLE'S REPUBLIC OF CHINA TRADE, 1970–75 [1]

[In millions of U.S. dollars]

Year	Total trade	U.S. exports	U.S. imports	Imbalance
1970				
1971	[2] 5.0		5.0	5.0
1972	95.9	63.5	32.4	31.1
1973	805.1	[3] 740.2	64.9	675.3
1974	933.8	[4] 819.1	114.7	704.4
1975 [5]	400.0	200.0	150.0	100.0

[1] U.S. Department of Commerce, "Highlights of Exports and Imports," FT–990 series.
[2] Via third countries only.
[3] Including $50,600,000 shipped via 3d countries and not reported destined for the Peoples Republic of China.
[4] Including $11,700,000 shipped via 3d countries and not reported destined for the Peoples Republic of China.
[5] Estimate by the Bureau of East-West Trade, U.S. Department of Commerce.

Sino-American trade has not developed evenly, and along with the rapid growth has come a substantial imbalance in favor of the United States. Although the Chinese settle their trade balances on a multilateral basis, the magnitude of the deficit has been of some concern to the Chinese and has been mentioned to American businessmen on numerous occasions as being highly undesirable. From table 2, it can be seen that the very large deficits of 1973–74 will decline sharply in 1975 as a result of increased Chinese exports and decreased Chinese purchases of U.S. agricultural products.

Expansion of trade has resulted in an increased American share in Chinese imports and exports. Table 3 shows the U.S. share of this trade in recent years.

TABLE 3.—U.S. SHARE OF CHINESE TRADE, 1972–74

[Percent]

	1972	1973	1974
U.S. share of People's Republic of China imports [1]	2.8	16.3	13.0
U.S. share of People's Republic of China exports	1.1	1.3	2.0

[1] These data are on a CIF basis, Chinese port.

[2] For detailed analysis of China's foreign trade, see Nai-ruenn Chen elsewhere in the JEC report.

The share of China's imports held by the United States in 1974 exceeded that of all the other Communist countries combined; about 12.5 percent of what the PRC imported came from these countries compared to 13.0 percent from the United States. Japan held over 29 percent of the market in 1974 while Canada and West Germany accounted for 7.5 percent and 6.3 percent, respectively. Japan and Hong Kong were China's best customers.

Composition of Trade

The major portion of American exports to China since the resumption of trade has consisted of agricultural products. The 50 leading exports to China in 1974 are ranked in order in table 4; 1973 is shown for comparison.

TABLE 4.—FIFTY LEADING UNITED STATES EXPORTS TO THE PEOPLE'S REPUBLIC OF CHINA, 1973-74

[In thousands of U.S. dollars]

Schedule B commodity group[1]	1973 Value	1973 Percent	1974 Value	1974 Percent
1. Wheat (041.0)	307,500	41.5	234,014	28.6
2. Cotton (263.1)	100,527	13.6	185,934	22.7
3. Soybeans (221.4)	55,396	7.5	138,241	16.9
4. Corn (044.0)	141,175	19.1	95,671	11.7
5. Aircraft; parts; and accessories (734.1/734.9)	58,711	7.9	60,116	7.3
6. Aircraft gas turbines; parts (711.4)	3,930	.5	16,194	2.0
7. Iron and steel scrap (282.0)	24,214	3.3	12,492	1.5
8. Tallow; inedible (411.3)	1,344	.2	7,539	.9
9. Kraft paper/paperboard (641.3)	2,405	.3	7,148	.9
10. Industrial process vessels; heat exchangers; parts (719.1)			6,042	.7
11. Compressors; centrifugal (719.2)			4,853	.6
12. Industrial process steam generating power boilers; turbines; and accessories (711.1/711.2/711.3)			4,549	.6
13. Drilling equipment (mining); excavators; parts (718.4)			3,858	.5
14. Drill and core bits; petroleum (695.2)			3,765	.5
15. Inorganic chemicals (514.6/514.7)	274	(2)	3,410	.4
16. Tobacco (121.0)	1,359	.2	2,718	.3
17. Steel pipe and tube; fittings (678.2/678.3/678.5)			2,556	.3
18. Fabricated structural steel (691.1)	(2)	(3)	2,348	.3
19. Insecticides; herbicides; agricultural chemicals (512.0)	1,889	.3	2,252	.3
20. Synthetic resins (581.2)	536	(3)	2,232	.3
21. Organic chemicals; n.e.s. (512.0)	402	(3)	2,202	.3
22. Geophysical equipment (729.5)	(2)	(3)	2,099	.3
23. Electronic navigational aids (724.9)	(2)	(3)	2,040	.2
24. Acrylic and polyester staple (266.2)	2,749	.4	1,551	.2
25. Instruments and mechanical appliances; not electrically operated (861.9)	(2)	(3)	1,329	.2
26 Instruments; electric or electronic for measuring; recording; testing; or controlling (729.5)	455	(3)	1,066	.1
27 Bags of textile materials (656.1)	(2)	(3)	1,005	.1
28. Woodpulp (251.7/251.8)	161	(3)	940	.1
29. Watch movements; parts (864.3)			891	.1
30. Filtering and purifying equipment (719.2)			480	.1
31. Telecommunications equipment (724.9)	4,184	.6	437	.1
32. Yarn thread of man-made fibers (651.6)			435	.1
33. Platinum (681.2)	2,970	.4	413	.1
34. Valves, oil field (719.9)			393	(3)
35. Tubes and semiconductors (729.3)	333	(3)	357	(3)
36. Vehicles (732.0)	568	(3)	315	(3)
37. Nuts, bolts, screws (694.2)	(2)	(3)	294	(3)
38. Fertilizer, phosphates (561.9)	4,736	.6	291	(3)
39. Industrial furnaces and burners (719.1)			285	(3)
40. Plastic products (893.0)			251	(3)
41. Radio and TV equipment (724.9)	(2)	(3)	221	(3)
42. Lubricating oils and greases (332.5)			220	(3)
43. Industrial trucks (719.3)			218	(3)
44. Phosphate rock (271.3)	451	(3)	184	(3)
45. Welding rod (698.8)			161	(3)
46. Computers and statistical machines (714.3)			159	(3)
47. Textile machine parts (717.1)			145	(3)
48. Hides and skins (211.1/211.6)	391	(3)	121	(3)
49. Refractory brick (662.3)			112	(3)
50. Power transmission line hardware (698.9)			108	(3)

[1] Based on an analysis at the 4-digit level using 7-digit information for clarification of commodity description.
[2] Less than $100,000.
[3] Less than .1 percent.

The 50 leading U.S. imports from China for 1974 are ranked in order in table 5; 1973 is shown for comparison.

Shipments of the leading commodities in 1974 included cotton textiles, $25.6 million; tin, $9.4 million; gum rosin, $7.9 million; artworks and antiques, $7.8 million; and fish and shellfish, $7.1 million.

TABLE 5.—50 LEADING UNITED STATES IMPORTS FROM THE PEOPLE'S REPUBLIC OF CHINA, 1973–74

[In thousands of U.S. dollars]

Schedule B commodity group [1]	1973		1974	
	Value	Percent	Value	Percent
1. Cotton fiber, fabric (652)	6,667	10.3	25,574	22.3
2. Tin (687)	7,801	12.0	9,396	8.2
3. Rosin (599)	1,245	1.8	7,876	6.9
4. Artworks and antiques (896)	5,612	8.6	7,773	6.8
5. Fish and shellfish (031/032)	1,037	1.5	7,057	6.2
6. Bristles (291)	5,125	7.9	5,925	5.1
7. Clothing and accessories (841)	1,523	2.3	5,607	4.9
8. Essential oils (551)	1,541	2.3	4,788	4.2
9. Silk, raw (261)	4,368	6.8	2,739	2.4
10. Tobacco (121)	956	1.5	2,641	2.3
11. Feathers and down (291)	1,728	2.6	2,142	1.8
12. Antimony (689)	225	.3	2,048	1.7
13. Spices (075)	1,470	2.3	1,917	1.7
14. Wool and other animal hair (262)	1,796	2.8	1,866	1.7
15. Vegetables (054/055)	717	1.1	1,562	1.3
16. Textile products and articles (655/656)	576	.9	1,317	1.1
17. Carpets, straw mats, and other articles of vegetable plaited material (657)	1,498	2.9	1,248	1.0
18. Gelatin, inedible (599)	1,255	2.0	1,189	1.0
19. Tungsten ore (283)	214	.3	1,095	1.0
20. Glassware and pottery (665/666)	1,106	1.7	1,038	1.0
21. Fireworks (571)	3,188	4.9	967	1.0
22. Pharmaceutical products (541)	148	.2	967	1.0
23. Precious and semiprecious stones, jewelry (667/897)	771	1.2	889	.8
24. Licorice root and extract (292)	(2)	(3)	672	.6
25. Footwear (851)	180	.3	550	.5
26. Antimony oxide (513)	374	.6	537	.4
27. Fruits (051/052/053)	1,123	1.7	530	.4
28. Natural drugs, vegetable origin (292)	529	.8	517	.4
29. Gloves, rubber or plastic (893)	(2)	(2)	498	.4
30. Wood manufactures, n.e.s. (631/632)	267	.5	405	.3
31. Meat (011/003)	255	.5	374	.3
32. Artificial flowers (899)	(2)	(3)	361	.3
33. Sugar and honey (061/062)	289	.5	358	.3
34. Graphite (276)	286	.5	348	.3
35. Turpentine (599)	178	.3	336	.3
36. Vegetable oils, fixed (422)	727	1.1	333	.3
37. Barium compounds (513/514)	(2)	(2)	326	.3
38. Food preparations, n.e.s. (099)	300	.5	322	.3
39. Rifles (value $25–$50), parts (894)			297	.3
40. Furniture (821)	236	.3	296	.3
41. Camphor (512)	(2)	(3)	270	.3
42. Benzenoid drugs (512)			253	.3
43. Gall nuts, crude or processed (292)	529	.8	246	.2
44. Musical instruments (891)	145	.2	244	.2
45. Organic chemicals, n.e.s. (512)	(2)	(3)	231	.2
46. Preparations of cereal, flour, etc. (048)	(2)	(3)	230	.2
47. Steel wire, carbon (677)			201	.2
48. Ansenic (513)			189	.2
49. Alcoholic beverages (112)	196	.3	186	.2
50. Talc, crude and manufactured (276/663)	150	.3	162	.2

[1] Based on an analysis at the 3-digit level using 7-digit information for clarification of commodity description.
[2] Less than $100,000.
[3] Less than 0.1 percent.

Of the total exported to China in 1974, $664 million or 81.2 percent consisted of agricultural products; 1973 data are $625.1 million or 84.5 percent. Shipments of the leading agricultural commodities in 1974 included wheat, $234 million; cotton, $185.9 million; soybeans, $138.2 million; and corn, $95.7 million. Leading nonagricultural products in 1974 were commercial jet transports, $60.1 million; aircraft engines, $16.2 million; iron and steel scrap, $12.5 million; paper and paperboard, $7.1 million; and industrial process vessels and heat exchangers,

$6 million. It should be noted that in two commodity areas where significant shipments occurred in 1973, soybean oil, $17.9 million and aluminum, $3.4 million, no U.S. exports were recorded in 1974.

Major Sales to China

Since 1972 the Chinese have turned to the major industrialized countries for massive purchases of complete plants, major segments of plants, and the associated equipment and technology. The U.S. share in these transactions has been significant although not yet commensurate with our reputation and ability to supply and service such installations and equipment. Particularly noteworthy as an indicator of future possibilities for the United States in the China market are some of the transactions in the industrial sector for which contracts have been signed.

In the most visible evidence of the new commercial relationship, as a result of the purchase of 10 Boeing 707 jet transports and accessories for about $150 million, American aircraft are being flown on China's new international routes to Europe and Japan as well as on domestic routes. In the largest U.S. nonagricultural transaction to date, the Chinese have contracted with the M. W. Kellogg Co. of Houston for the supply of eight large ammonia plants, value about $215 million. The ammonia is to be used in the manufacture of urea for fertilizer. Deliveries of equipment for the first plant began in 1974 and is to continue in a regular program until all eight plants are complete. Kellogg technology is also embodied in ammonia plants being supplied by Japan.

Other important transactions have included automotive gear cutting equipment from the Gleason Works in Rochester; satellite earth stations from RCA and Western Union International; blast hole drills and power shovels from Bucyrus-Erie; very large off-highway trucks from Wabco; petroleum exploration equipment from GeoSpace Corp.; a petroleum drilling equipment from the Baker Trading Co., and others. Transfer of U.S. technology to China has occurred with Kellogg as already mentioned; with Standard Oil of Ohio, acrylonitrile know-how; Standard Oil of Indiana, polypropylene technology, and Atlantic Richfield-Engelhard, paraxylene process know-how; and possibly others.

The Canton Fair

The Chinese Export Commodities Fair, started in 1957, is held twice annually, April 15–May 15 and October 15–November 15 in Canton (Kwangchow) about 90 miles from Hong Kong. Canton has always been the traditional point of contact between Western traders and Chinese merchants and remains so today, at least for exports from China. A major share of the PRC's import contracts are signed in Peking these days, but the Fair accounts for about 40 percent of China's annual export business: some Chinese purchasing is also done there. For many commodities, the Fair provides the best single opportunity to assess the PRC's export capabilities and market potential.

The Fair is sponsored jointly by China's foreign trade corporations and takes the form of combining trade negotiations with the display of Chinese exhibits; no foreign commodities are shown. Attendance at the Fair is only by invitation from the trade corporations or Fair authorities. In 1974, the Chinese opened a major new facility for the Fair and the key role it plays in marketing Chinese commodities for export seems assured. Late in 1974, the Chinese announced a special fair for carpets, the Chinese Export Carpets Fair, which was held in Tientsin from February 25 to March 5. Other special fairs occur from time to time.

Until the 1972 Spring Fair, Americans were noted by their absence at Canton,[3] but in the six Fairs since then have enjoyed ever greater attendance and increased business. U.S. firms traded about $60 million in 1974 against $50 million the preceding year; most of the transactions were purchases by U.S. importers although some export business was done by visiting Americans. Estimated attendance has risen from about 245 Americans representing some 128 firms at the Fall Fair of 1973 to about 440 Americans representing some 275 U.S. companies either directly or through overseas affiliates, at the Spring Fair of 1975.

F. Doing Business With China

Approaching the Market

In China foreign trade is a state monopoly controlled by the Ministry of Foreign Trade and conducted exclusively through a network of nine corporations in accordance with priorities established considerably in advance by the PRC's economic plan. The foreign trade corporations, having main offices in Peking with branch offices in major cities, are organized according to the commodities or services for which they are responsible.

The following is a listing of the nine corporations showing typical commodities handled by each:

China National Chemicals Import and Export Corp.—chemicals, rubber, petroleum, and fertilizers.

China National Native Produce and Animal By-Products Import and Export Corp.—tea, tobacco, spices, dried fruits and vegetables, fireworks, bristles, wool, hides, carpets, and living animals.

China National Metals and Minerals Import and Export Corp.—iron and steel products, nonferrous ores and metals, nonmetallic minerals, coal, cement, and other construction materials.

China National Light Industrial Products Import and Export Corp.—general merchandise of all kinds, paper, cameras, toys, building materials, appliances, leather products, jewelry, and handicrafts.

China National Textiles Import and Export Corp.—cotton, silk, synthetic and manmade fibers, cotton and woolen piecegoods, and wearing apparel.

China National Cereals, Oils and Foodstuffs Import and Export Corp.—oils and fats, poultry, meat, eggs, fresh fruit, fish, canned goods, sugar, wines, dairy products, vegetables, and grain products.

China National Machinery Import and Export Corp.—machine tools, engines, turbines, mining and construction machinery, transport equipment, machinery for the textile, chemical, rubber, and other industries, telecommunications equipment, and instrumentation.

China National Technical Import Corp.—importation of complete plants and technology.

China National Complete Plant Export Corp.—exports complete factories, works, and projects, usually, but not exclusively as part of an economic aid agreement.

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[3] Actually several Americans visited the 1971 Fall Fair.

Among the more important PRC trade-related entities are:

China Council for the Promotion of International Trade (CCPIT)—CCPIT, founded in 1952, serves as a liaison between China's trade corporations and the institutions of foreign trade in other countries. Its responsibilities include arranging economic and trade-related exchanges including Chinese exhibitions abroad and foreign exhibits in China. Through its Foreign Trade Arbitration Commission and Maritime Arbitration Commission, the CCPIT has responsibility for settlement of legal disputes related to foreign trade and maritime affairs.

China National Foreign Trade Transportation Corp.—arranges customs clearance and delivery of all import/export cargoes; arranges insurance.

China National Chartering Corp.—charters foreign vessels and books shipping space required for Chinese import and export cargoes.

China Commodities Inspection Bureau—carries out inspection of imports and exports on behalf of the foreign trade corporations.

People's Insurance Co. of China—provides international trade and maritime risk underwriting.

Bank of China—is a subsidiary of the People's Bank of China responsible for all foreign exchange transactions involving the PRC.

China Scientific and Technical Association—with the CCPIT plays a role in arranging scientific and technical symposia in China. The association is responsible for planning scientific research and development and is charged with organizing and controlling China's professional societies.

China Resources Co. (CRC)—acts as the principal agent in Hong Kong for a number of the Peking-based trade corporations.

Establishing Contact

It takes time and patience to successfully enter the China market, whether exports or imports are involved and whether large or small firms are involved. Prior to establishing contact, firms should give thought to the answers for the following questions:

Is the firm prepared to invest considerable money initially without assurance of an early return;

Is the firm prepared to negotiate the first transaction for 1 or 2 years;

Is the firm prepared to obligate the necessary senior talent and technical expertise;

Is the firm prepared to walk away from an unpromising negotiation at any time;

Is the firm prepared to resist offering concessionary terms in order to penetrate this market.

If some answers to these questions are negative, it may be prudent to rethink trying to enter this market.

Generally, the first step in establishing commercial contact is to prepare a proposal and send it to the foreign trade corporation in Peking having jurisdiction over the commodity involved. A successful proposal is likely to result in a request for more information, for reworking based on specifications supplied by the Chinese, or in an invitation to come to Peking and discuss the matter further. If the U.S. firm is buying Chinese goods, it would normally hope to receive an invitation to the Chinese Export Commodities Fair in Canton; requesting an invitation to the Fair is appropriate. In a few cases where the Chinese have an urgent requirement for a commodity, contact may be made directly with the American firm. It is preferable, but not essential, for the American firm to work directly with trade corporations rather than through agents.

The form of the initial proposal is important even though the ultimate decision to purchase or not purchase a specific commodity rests on the plan requirements of the Chinese economy, rather than on the attractiveness of a particular proposal. The proposal should be straightforward and sufficiently explicit and technically comprehensive to permit an in-depth evaluation of the products in question by the Chinese.

The foreign trade corporation is the intermediary between the American firm and the Chinese end-user. For this reason, it is essential to provide up to 20 copies of the pertinent technical information to be forwarded to the end-users by the trade corporation. Depending on the products involved, especially in the case of high-cost capital equipment or complete plant, it may be appropriate to invite a technical delegation to visit similar plants and equipment in the United States.

If the Chinese are interested in a proposal, they can be expected to reply. However, it takes considerable time—often months—for a proposal to be processed and assessed. No response probably indicates no Chinese requirement at the time. Firms convinced their products mesh with Chinese plan requirements should keep products and literature before the appropriate trade corporation. In general, it is advisable to follow up periodically with additional material and samples, especially with regard to any product improvements that would enhance the initial approach. It should always be remembered that the foreign trade corporations alone are responsible for negotiating contracts, not the end-user, although end-users will often be present during the discussions.

Negotiations

Negotiations with Chinese trade officials will likely be thorough and protracted and emphasize rigorous attention to detail. Such invitations are normally issued only to those firms in whose products the Chinese have a genuine business interest. Careful preparation for negotiations is a must and businessmen should expect to confront very astute bargainers.

Competition among foreign businessmen is keen, and the Chinese exploit this situation to extract the best possible terms. Contracts are usually not awarded on the basis of open competitive bidding. Many factors, including price, enter into the decision. Chinese negotiators prefer hard, honest bargaining and have a distaste for hard sell tactics or being rushed; little salesmanship is involved. They are usually quite well versed on the American company and its product line and discrepancies during presentations are quickly noted. It is very important to include technically qualified personnel on the negotiating team.

Depending on the commodities involved, the price quotes asked for by the Chinese are most apt to be f.o.b. U.S. port, thus enabling the Chinese to use their own charters and insurance. Most transactions in the China trade call for payment by letter of credit. It is prudent not to make a sacrifice price offer or take a loss just to get into the market, as the Chinese are apt to insist on the reduced price in future negotiations.

The contracts used by the trade corporations are basically standardized, differing somewhat from corporation to corporation and from commodity to commodity. The language of the contract should be carefully read in order to preclude misunderstandings later. All aspects of the agreement should be incorporated into the contract, for the Chinese will adhere strictly to its written provisions and will require the seller to do so, too. Special attention should be directed to clauses concerning packing and shipping instructions, delivery times, guarantees and warranties, penalties, and force majeure.

Business Assistance

With the advent of trade in the renewed relationship problems for the American importer and exporter arose due to the long lack of contact and because many Americans were quite unfamiliar with how to do business in a centrally planned economy exercising monopoly control over foreign trade. A real need for qualified business assistance developed.

To secure such assistance the American importer or exporter has recourse to the National Council for United States-China Trade, a nonprofit, private organization maintaining close liaison with the U.S. Government. The Council maintains a business counseling service, a translation service, and it publishes the United States-China Business Review bimonthly. The Council also cooperates in the publication of the American Industrial Report, a magazine in Chinese sent to trade corporations and end-users in the PRC and in which American firms can advertise. The Council is the recognized counterpart of the CCPIT, with which it has agreed to cooperate in the exchange of trade missions and trade exhibitions between the United States and China.

Another point of contact for economic and commercial assistance is the Office of People's Republic of China and Mongolia Affairs in the Department of State's Bureau of East Asian and Pacific Affairs.

The People's Republic of China Affairs Division in the Department of Commerce's Bureau of East-West Trade has a professional staff engaged daily in advising Americans on all aspects of how to do business in China.[4] This group closely follows the current economic activity of the PRC, both domestically and its foreign trade relationships, and is prepared to provide, where possible, market analyses of sectors of Chinese industry for American commercial interests. The Bureau also has Trade Development Assistance and Trade Promotion Divisions providing specialized services to American exporters in the area of problem solving, trade missions, and trade exhibitions.

The PRC Liaison Office in Washington has been receiving American businessmen and providing advice on China trade, but contacting this Office should not be regarded as a substitute for writing directly to the foreign trade corporations in Peking. Once in Peking, the U.S. Liaison Office may assist in providing advice on the trade corporations and by generally apprising Americans of the economic situation in China.

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[4] Additional detail on this subject may be found in the Bureau's publications: OBR 74–49, Doing Business With China, October 1974; OBR 74–21, Basic Data On The Economy of the PRC, June 1974: OBR 74–64, Financial Practices in United States-China Trade, December 1974; and OBR 74–50, China's Foreign Trade Policy: A Current Appraisal, October 1974.

In addition to the above-named points of contact for businessmen, assistance in understanding the China market may be obtained from the U.S. Consulate General in Hong Kong, the American Embassy in Tokyo, the American Chamber of Commerce in Hong Kong, from the Field Offices of the Department of Commerce scattered around the United States, and from private consultants and firms specializing in trade with China.

Regulatory Aspects of Trade

With the exception of certain furs embargoed by the Trade Agreements Extension Act of 1951, goods may be imported into the United States from the People's Republic of China subject to the same general rules that apply to imports from other countries (i.e., proper labeling, food and drug regulations, et cetera). Goods imported from the PRC, however, are dutiable at rates listed in column II of the Tariff Schedules of the United States. These rates are generally higher than the column I rates on goods from countries with which the United States has a reciprocal most-favored-nation tariff agreement.

The import of certain Chinese and Russian furs (ermine, fox, kolinsky, marten, mink, muskrat, and weasel—dressed or undressed) is prohibited by the Trade Agreements Extension Act of 1951 as amended by the Trade Expansion Act of 1962.

Chinese imports could also be affected by U.S. obligations under arrangements regarding international trade in textiles and apparel. Under the Multi-Fiber Arrangement (MFA) Regarding International Trade in Textiles, effective January 1, 1974, the United States now has agreements or has initialed Memoranda of Understanding covering bilateral textile and apparel agreements with 26 countries, but not with the PRC. Two-thirds of all U.S. cotton, wool, and man-made fiber textile, and apparel imports are covered by bilateral agreements. Each agreement provides for trade growth, assured market access, flexibility to adjust restraint levels in response to market changes, and provisions for consultation. In addition, each agreement contains an equity clause assuring the bilateral partner that its exports will not be restrained to the benefit of imports from countries with which the United States does not have a textile agreement. In 1974, the PRC was the leading supplier of cotton textiles among those countries with which the United States does not have an agreement.

U.S. exports to China and other Communist destinations are subject to controls provided for by the Export Administration Act of 1969 as amended and extended by the Equal Export Opportunity Act of 1972 and the Export Administration Amendments of 1974. One purpose of this legislation is to authorize controls over the export of goods and technology that would contribute to the military potential of these countries in a way that would adversely affect U.S. national security. The legislation also declares it to be the policy of the United States to encourage trade in nonsensitive items with all nations, including China, with whom we have diplomatic or trading relations. Since 1969 the general trend in the administration of export controls has been toward liberalization of controls on all but the most strategically sensitive items.

Another purpose of the legislation is to insure that the quality and composition of exports does not occur in a manner that would adversely affect the welfare of the U.S. domestic economy. As a result there have been short supply controls instituted over various commodities from time to time. Limitations were placed on the export of iron and steel scrap between July 2, 1973 and December 31, 1974. The quota system on the export o" petroleum and petroleum products continues as does a requirement that fertilizer exports be monitored.

The Johnson Debt Default Act of 1934, as amended, prohibits under criminal penalties certain financial transactions by individuals and firms in the United States involving foreign governments which are in default in the payment of their obligations to the United States unless they are members of the International Monetary Fund or the International Bank for Reconstruction and Development. The PRC is not a member of either organization. The prohibited transactions include the making of loans to, and the purchase or sale of bonds, securities, or other obligations of, a foreign government which is within the statutory category, which under some interpretations could include the PRC.

Even if the Johnson Act were held to be applicable to the PRC, it is not a significant impediment to financing of trade with China since the Attorney General has ruled that financing arrangements lie beyond the scope of the act:

> If they are directly tied to specific export transactions, if their terms are based upon bona fide business considerations, and if the obligations to which they give rise "move exclusively within the relatively restricted channels of banking and commercial credit."

With the series of amendments to Foreign Assets Control Regulations since 1969, there are no longer any special controls on the financing of U.S. trade with the PRC. Eximbank financing and guarantees, however, are not currently available.

The PRC, of course, has its own regulations governing foreign commerce. Tariffs are assessed on imports and inspection of both imports and exports is carried out by the China Commodities Inspection Bureau. The Customs Administration of the PRC publishes a schedule of tariffs embodying most-favored-nation tariffs and ordinary or higher rates. However, for purposes of U.S. exporters, import licensing, customs formalities and tariffs do not exist as processes separate from the conclusion of contracts and need not concern the potential exporter. Foreign visitors to China are assessed duties on goods brought in for personal use when in excess of specified nominal duty-free amounts.

G. Issues and Problems

The Sino-American commercial relationship quickly saw trade rise to significant levels, saw Liaison Offices opened in the respective capitals, and found American businessmen traveling to China in increasing numbers. Unquestionably, a degree of normalization had returned to the long dormant commercial relationship.

Currently, however, certain important commercial issues place some limit on the further normalization of trade relations. Significant improvement in the commercial relationship calls for their resolution.

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Coupled with these issues are some of the usual business problems occurring between trading partners everywhere as well as some peculiar to United States-China trade. With the passage of time traders on both sides have become more familiar with the business practices of the other, with commercial problems tending to be better understood and subject to resolution through mutually satisfactory discussion. While some progress is being made in improving the commercial climate through melioration of these business problems, resolution of commercial issues will require negotiations between the two governments.

Issues Outstanding

BLOCKED ASSETS/PRIVATE CLAIMS

Settlement of the related issues of Chinese blocked assets and U.S. private claims will be required before certain desirable steps in United States-Peoples Republic of China commercial relations can be taken. These issues stem from the blocking by the United States of Chinese dollar denominated accounts and other assets on December 17, 1950 after PRC military forces entered North Korea, and from the subsequent Chinese decree of December 29, 1950 announcing seizure of American public and private property in China.

In 1966, the Congress enacted the China Claims Act, authorizing the establishment of a Foreign Claims Settlement Commission to undertake an evaluation of claims by American nationals for losses due to Chinese nationalization of property and other assets after October 1, 1949. Claims by private U.S. citizens and corporations adjudicated by the Commission total about $197 million.

The Treasury Department, responsible under the Foreign Assets Control Regulations for maintaining control over the blocked Chinese assets, undertook a second census of these assets in June 1970. Since the first census in 1951, many changes in the assets had occurred. The completed census placed the value of these accounts in June 1970 at $76.5 million, a figure subject to further change.

The continuing impact of these unresolved issues has had some impact on United States-Peoples Republic of China trade, although it is not possible to say that trade turnover would have been so many millions greater had the issues been resolved. Unresolved, these issues prevent direct shipping and direct airline connections by the flag carriers of the two countries owing to the possibility that private claimants might seek redress through the courts by attaching ships, aircraft, or other PRC property which came into the United States. Direct banking is forestalled for the same reason and the resultant need to work through third country correspondent banks is cumbersome for American traders. The exchange of trade exhibitions is virtually precluded. While it is true that significant trade has transpired, a cost has been incurred by failure to resolve these issues.

In 1973, Secretary of State Rogers met with Foreign Minister Chi Peng-fei in Paris where the two sides agreed in principle to the resolution of these issues. Further technical discussions have been held but a settlement has not been reached.

In addition to the private claims of U.S. nationals, there exist potential public claims arising from an Eximbank loan, from large Lend-Lease loans of money and equipment during the Sino-Japanese War, and from other obligations of previous Chinese governments.

MOST-FAVORED-NATION TARIFF TREATMENT

Another issue about which much has been written since the resumption of relations is that of U.S. most-favored-nation (MFN), nondiscriminatory tariff treatment for China. Nondiscriminatory tariffs for the PRC were withdrawn pursuant to the Trade Agreements Extension Act of 1951. In the Trade Expansion Act of 1962, as amended, section 231 provided for mandatory continuation of the prohibition against MFN tariffs for countries under Communist domination. This proviso is currently in effect although the Trade Act of 1974, discussed below, provides a mechanism by which MFN tariff treatment for China could eventually be restored.

PRC officials have from time to time raised the MFN issue with U.S. businessmen and others. Presumably Peking not only wants MFN but feels entitled to it as part of the Shanghai Communique commitment to conduct trade on the basis of "equality and mutual benefit." China has included MFN tariff clauses in trade agreements with trading partners and it seems likely that the PRC regards such status as conferring political as well as economic benefits.

It is difficult to isolate and evaluate the economic effect of the discriminatory tariffs now being applied to Chinese imports into the United States because other issues and problems are impacting simultaneously. Some magnitude of their impact in the past can be seen from 1973 trade data that shows the duty levied on all U.S. trading partners was 8.5 percent of the amount of dutiable goods imported into the United States whereas the duty levied on PRC goods was 25 percent of the value of their dutiable exports to the United States. As for the amount of trade in the future, some preliminary studies show that the effect of granting MFN would result in increases in trade ranging from modest (15–20 percent), now, to quite substantial increases (up to 200 percent) with full normalization of relations, later.

Discriminatory tariffs hinder trade by rendering some Chinese commodities noncompetitive and may prevent the entry of some commodities that are unique to China or where China occupies a dominant position in the world supply. Opening of the U.S. market would offer an important alternative source of demand for China. Finally, of course, the discriminatory tariffs force the American businessman and consumer to pay more for some Chinese commodities. Without the advantages of MFN tariff treatment, China is less able to compete freely in the world's largest market and earn more dollars to import American commodities in return.

TRADE ACT OF 1974

The Trade Act of 1974 has several provisions applicable to our commercial relations with the PRC. The most important of these, title IV, provides a mechanism by which the United States could extend MFN status to China. By law this must be done in the context of a Sino-American bilateral commercial agreement valid initially for a 3-year period after approval by a concurrent resolution of both Houses of the Congress. The agreement must, inter alia, contain safeguards against market disruption, contain arrangements for the settlement of commercial disputes, make provision for bilateral consultations, and secure protection for the industrial property rights of U.S. nationals equivalent to those contained in the Paris Convention for the

Protection of Industrial Property. The agreement is subject to suspension for national security reasons.

Moreover, the granting of MFN may not be extended to any nonmarket economy nation that denies its citizens the right or opportunity to emigrate without imposing more than nominal exit fees or taxes on documents or individuals. The President may waive the free emigration requirement for 18 months subject to congressional approval, if a finding is made and assurances given that the waiver will promote free emigration. Subsequent extensions of the waiver are subject to congressional approval at 1-year intervals.

As a practical reality, it would be difficult to conclude negotiations with the PRC on the MFN issue unless the issues of Chinese blocked assets and U.S. private claims are first resolved. Even assuming the Chinese are prepared to begin discussions on a trade agreement containing the necessary provisions, considerable time would be required. The question of Chinese emigration practices would have to be addressed.

Problems of American Business

BUSINESS FACILITATION

For the American businessman who would like to export his products to the PRC, selling in China presents a variety of problems not generally found in transactions with market economies. Buying from China also presents vexing problems. It is in the business facilitation aspect of trade that some progress can be continued while waiting resolution of the more difficult, government-to-government issues confronting the commercial relationship.

It requires a certain amount of patience and determination to continue to pursue sales in the PRC once a businessman discovers he cannot find out from the Chinese what they really want, that he may only proceed to China upon being invited, that he is unlikely to get to visit the plant of the end-user of his product although he may talk to him in Peking, and that it may not be necessary to "sell" his product although he may be pumped for more technical information concerning its manufacture than he feels comfortable about revealing. When he inquires about credit, arbitration, protection of industrial property rights, and other elements of business practice taken for granted in market economies, he is confronted with either their absence or a form of practice with which he has had no experience.

If the businessman is buying goods from China, the chances are that he will attend the Chinese Export Commodities Fair in Canton. Here he may find tiered pricing systems favoring countries of the Third World to his disadvantage, he may encounter great reluctance on the part of the foreign trade corporations to modify products to suit the American market, he will find a reluctance to grant exclusive marketing rights for the United States, labeling and packaging may cause problems, credit arrangements and rates of exchange are cause for concern, and frequent Chinese unwillingness to differentiate between wholesalers and retailers in setting prices and in offering quantity discounts may be disconcerting.

Particularly vexing, is the inability of the American businessman to ascertain whether his product is one for which a market exists in

China. Often proposals to the trade corporations in Peking will go unanswered and the exporter is left to guess whether there is no interest on the part of the Chinese or whether his proposal went astray in the mail. The U.S. exporter needs to understand more of how equipment and technology requirements are generated in the PRC.

Basically, the Chinese make 10-year, 5-year, and annual plans for the economy with great emphasis given to fulfillment of product and equipment requirements from domestic sources within the PRC. Only after it has been established that indigenous sources cannot meet the demand will Pekings trade corporations be commissioned to purchase from abroad. Since the plans are not published it is difficult to know what products the Chinese may be interested in although as American business experience accumulates, advisers in the Department of Commerce and elsewhere are increasingly able to raise the quality of their advice on this matter. Normally, trade missions and trade exhibits are effective tools for ascertaining market conditions, but the Chinese have only recently responded to American initiatives on trade missions. There have been no exhibitions.

These problems will not all go away, but as they are better understood, as experience is gained, they are reduced to more manageable proportions according to veteran American traders. Efforts on both the Chinese and American sides are contributing to slowly improving business practices.

DISPUTE SETTLEMENT AND PROPERTY RIGHTS

The American businessman is faced with somewhat more difficult commercial problems when questions of industrial and other property rights and arbitration of disputes arise. For example, China is not party to any of the multilateral conventions on the protection of patents, trademarks, or copyrights.

The PRC has no patent law. Procedures which have governed recognition of inventions and technology for use and compensation are embodied in the "Regulations on Awards for Inventions" and "Regulations on Awards for Technical Improvements," approved October 23, 1963, by the PRC State Council. Under these regulations the State retains ownership of all inventions and technology and reserves the right to sell to foreigners, through its Ministry of Foreign Trade, those inventions which are authorized for sale by the State Scientific Commission.

Although there is no patent protection per se available to foreign firms in China, the Chinese have shown some willingness, on a case-by-case basis, to give contractual assurances to limit the use of the seller's technology within China and to prohibit the reexport of the technology to third countries.

"Measures for the Control of Trade Marks," issued by the PRC April 10, 1963, and supplementary "Enforcement Rules," issued April 25, 1963, govern trademark protection in that country. Foreign firms must file all trademark applications through the China Council for the Promotion of International Trade (CCPIT) in Peking, as their designated agent to handle trademark procedures. Registration of a trademark is granted to the first applicant. A foreigner may apply for a trademark registration only if: (1) A reciprocal agreement on registration of trademarks exists between his country and the PRC and, (2) his mark is already registered by him in his home country. Since there is no reciprocal agreement on trademarks between the United States and Peoples Republic of China, U.S. nationals cannot now register their marks in that country.

The PRC has not joined the Universal Copyright Convention or Berne Copyright Convention, or concluded any bilateral copyright protection agreement with the United States. So far as is known, U.S. authors have no copyright protection available in the PRC for their works.

Arbitration of contractual disputes falls under the jurisdiction of the Foreign Trade Arbitration Commission of the CCPIT. Maritime disputes may be brought before the Maritime Arbitration Commission, also under CCPIT. While the Chinese prefer arbitration to be handled by these Commissions, they have agreed to clauses naming Sweden, Switzerland, and Canada as locations for arbitration. Whenever possible, the Chinese prefer a negotiated settlement of disputes to arbitration.

Although businessmen can cope with the problems of arbitration and property rights to some extent by coverage in contracts, the more satisfactory resolution is likely to occur as part of a negotiated trade agreement between the United States and China.

Chinese Trade Problems With Us

It would be quite unfair to suggest the problems are only those faced by Americans trading with China. Starting with rather substantial trade imbalances, although the deficit will be down considerably in 1975, the Chinese could recite a litany of complaints about how our regulations affect their exports. Consider, for example, that American corporations maintain staffs of legal experts to keep abreast of Federal and State regulations concerning commercial matters such as food and drug laws, environmental controls, labeling, flammability, and others. That the Chinese do not yet fully comprehend and are rankled by some of these requirements seems understandable. Given time and proper exposure to the market these problems will diminish.

The Chinese effort to better understand the U.S. market for their goods, for reasons not altogether clear, has been quite slow in gaining momentum. Their trade corporations have experienced requests by American importers for special packaging, for style changes, and commodity modifications, for labeling, and other things that may be difficult for a planned economy to accommodate to quickly. Many groups, public and private, have urged that the Chinese visit American merchandising institutions, trade associations, and other elements of the U.S. marketplace, but until the latter part of 1974, the Chinese did very little of this. With the PRC textile trade delegation visit in February 1975 and the China Council for the Promotion of

International Trade visit later in 1975, the Chinese may now be making a somewhat more concerted effort to understand the problems facing entry of their commodities into the U.S. market.

The Chinese have also encountered problems caused by U.S. regulations covering our exports. U.S. short supply controls in 1973 resulted in the licensing of iron and steel scrap by quota allocation and since China in the recent past had had no historical pattern of scrap purchases from the United States, their quota was disappointingly small and caused them to complain to the U.S. Government. The allocation of scrap by quota was terminated at the end of 1974, but in the future controls for reasons of short supply in the United States may reappear in a way that could effect Chinese purchases of various U.S. commodities.

The Chinese have also encountered difficulties with the quality of our agricultural exports. A form of smut on some U.S. shipments of wheat have been found by the Chinese and allegedly they have found spoilage and other foreign matter in U.S. corn and soybean shipments. U.S. inspection procedures on wheat have been strengthened. Although the Chinese did cancel or defer shipment of some agricultural products in the latter part of 1974 and in early 1975, these quality problems were not thought to be a major cause for this action.

H. Prospects

Normalization of Commercial Relations

The visit of President Nixon to China in 1972 and the resultant Shanghai Communique renewed United States-China relations after a hiatus of 22 years. Trade was restored and American businessmen once again traveled to China. Despite the fact that the conditions under which this new business was carried out were quite new to Americans, in some cases strange and not well understood, the talk in many quarters quickly turned to the manner in which the emerging commercial relationship could be "normalized" or at least, further improved.

Normalization of commercial relations in this context means achievement of relations about as normal as could be expected in business dealings between individual firms in a market economy and those in the monolithic foreign trade corporations of a centrally planned economy.

Commercial relations between the United States and some of the socialist states has been of a much longer duration and has been institutionalized to a much greater extent than with the PRC and, in this sense, business activities with Yugoslavia and Poland approximate normality in commercial relations with socialist states at this time.

The degree to which the elements of commerce have been institutionalized between the United States and the socialist states is reflected in table 6.

TABLE 6.—STATUS OF U.S. COMMERCIAL RELATIONS WITH SOCIALIST COUNTRIES, JUNE 1975

	Albania	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Romania	U.S.S.R.	People's Republic of China	Yugoslavia
Diplomatic recognition	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes.
MFN	No	No	No	No	No	Yes	(9)	(7)	No	Yes.
EximBank	No	No	No	No	No	Yes	(9)	(8)	No	Yes.
OPIC	No	No	No	No	No	No	(9)	No	No	Yes.
Martime agreement	No	No	No	No	No	No	No	Yes	No	Yes.
Double taxation treaty	No	No	No	No	No	(9)	(9)	(9)	No	(1).
Consular convention	No	Yes	Yes	(1)	Yes	Yes	Yes	Yes	No	Yes.
Civil aviation agreement	No	No	Yes	No	Yes	Yes	Yes	Yes	No	(3).
Defaulted bonds outstanding	No	(1)	Yes	Yes	(1)	No	(1)	Yes	(4)	No.
Financial claims outstanding	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No.
Johnson Act applicability	No	No	Yes	(4)	Yes	Yes	No	Yes	(4)	No.
Fisheries agreement	No	No	No	No	No	Yes	Yes	Yes	No	No.
Science, technology agreement	No	No	No	No	No	Yes	No	Yes	No	Yes.
Joint commercial commission	No	No	No	No	No	Yes	Yes	Yes	No	No.
Trade council (private)	No	(5)	(5)	No	(2 5)	(5)	(5)	Yes	Yes	Yes.
Trade agreement	No	No	No	No	No	No	(9)	(6)	No	No.
Long-term economic cooperation agreement	No	No	No	No	No	No	No	Yes	No	No.

1 Under negotiation.
2 Preliminary agreement reached.
3 Unilateral permit only.
4 Subject to legal interpretation.
5 With U.S. Chamber of Commerce.
6 Signed in October 1972 but not in force because there is no U.S. legislative authority for "unconditional" MFN treatment as provided for in the Agreement. Certain other provisions are being implemented by both sides.
7 See footnote 6.
8 Credits available from October 1972 to January 1975. Pursuant to Export-Import Bank legislation and Title IV of the Trade Act of 1974, bank facilities are no longer available, but limited facilities could be restored if accord is reached on certain provisions of the Trade Act.
9 Pending Congressional approval.

Table 6 shows that with the exception of Albania United States commercial relations with the PRC are the least developed among the socialist states. The table also shows that Yugoslavia and Poland, the countries considered to have the most normalized relations with us, have most-favored-nation tariff treatment and have no financial claims outstanding, issues discussed earlier with respect to the PRC. These two key commercial issues loom large in the path of commercial relations with the PRC. Although the mechanism for extending MFN to China has now been established with passage of the Trade Act of 1974, it is burdened with difficult requirements and would likely require considerable time to negotiate. Thus, at this time it is not possible to predict with assurance the order and timing with which these issues might be resolved by Washington and Peking.

Meanwhile it does seem possible that further progress will be made in the area of business relations. The continuing work of the National Council, the visit to the United States by the PRC textile study group, the expected visit of the CCPIT later in 1975, and the increasing number of Americans traveling to China on business are all factors pointing in this direction.

Growth in Trade

Sino-American trade in 1975 will be down from the high point of 1974. This decline, from $933.8 million to an estimated $400 million is attributable to Chinese cancellation of contracts for agricultural products and to their failure to date to contract for new shipments of American wheat, cotton, corn, or soybeans. When the Chinese will be back in this market buying depends heavily on their own harvests, on the state of their grain reserves, on the foreign exchange situation, and on agricultural conditions and prices in Canada, Australia, and other nations currently supplying these commodities to China. The quality of some U.S. agricultural products shipped to the PRC has not been good, a problem which must be overcome if full Chinese confidence in the American product is to be restored. Because of the variable nature of agricultural purchases and their magnitude in United States-China trade, they will continue to dictate overall U.S. export performance during the next few years.

While the nonagricultural raw material and semifinished product category of American exports to the PRC fell off in 1974, much of this decline can be traced to U.S. short supply controls over iron and steel scrap. Now that controls over scrap have been terminated, shipments of scrap to China may well resume, particularly in view of the continued tight iron ore and coking coal supply situation in the PRC. Pulp, paper, chemicals, and synthetic resins all made noteworthy jumps in 1974 and prospects appear good for continued exports of significance. While the export of U.S. aluminum and platinum, probably for catalyst, was down in 1974, these products could again attain importance if the American price is competitive. Generally, the longer range outlook for growth of U.S. exports of selected nonagricultural raw materials and semifinished products to the PRC is good.

Evidence that the Chinese will come to the United States for machinery and advanced technological products is seen in shipments of jet transports, ammonia plants, telecommunications facilities, very large off-highway trucks, geophysical equipment, gear cutters and grinders, instrumentation, and in several technology transfers in the petrochemical sector as mentioned earlier. The potential for U.S. exports in this area, however, has hardly been touched. Especially disappointing to date have been the limited sales of petroleum exploration, drilling, and production equipment given the obvious priority accorded this sector by China. If China is going to boost oil production and exports, at least over the next several years as appears to be the case, Western suppliers, particularly the United States, should be expected to play a larger role.

The Chinese have purchased numerous petroleum refining and petrochemical plants from foreign sources and, again, with the exception of the Kellogg contracts for ammonia plants, the American potential has not been reached. The same comment would apply in other industrial sectors such as ore and coal beneficiating equipment, power and industrial gas turbines, nuclear and supercritical electric power stations, food processing and canning machinery, textile knitting equipment, certain large construction equipment, numerical control machine tools, transfer machinery, process control instrumentation, air traffic control systems, semiconductors, and digital computers although in some of these areas U.S. validated export licenses might be required and would not be granted if product specifications or end-use indicate strategic application. Prospects for additional sales of commercial jet aircraft and helicopters appear possible as does technology relating to the production of a wide range of machinery components.

Regardless of the type of transaction, the Chinese can be expected to veto any form of direct foreign participation in their economy. For this reason, there appears to be no possibility of entering into any type of joint venture arrangement for the foreseeable future. Coproduction schemes also appear unlikely for the same reason. Consulting arrangements do not appear promising. For example, the PRC's electric power system would probably benefit substantially from a management and consultative study, but this is not in the cards. Technical assistance agreements are possible and, of course, the provision of turnkey plants with on-site supervision during construction and start-up and the sale of technology have already occurred.

There is hope that in the 1975–76 period the Chinese will be receptive to more visits by American trade missions, probably of the type organized on the basis of a specific industry, such as machine tools. The first such mission from China, a small textile trade group visited the United States in February and March 1975. The San Francisco Chamber of Commerce mission visited China in May and the Electronic Industries Association group is scheduled for July. The exchange of trade exhibits seems unlikely until the assets and claims issues are resolved and, in any event, the leadtimes required for these exhibits are such that it would be nearly 1977 at the earliest before a show could be mounted.

The outlook for Chinese exports to the United States over the next several years is one of continued growth. The rate of this growth will depend on the state of the U.S. economy, on Chinese perception of this market and willingness to adapt to its demands, and on the availability in China of commodities in the requisite quantity and quality sought by Americans. Fish and shellfish showed good growth in 1974 as did tea, spices, vegetables, and other food preparations. These should continue at sustained levels. Tin, tungsten, and antimony among the metals will continue to register imports of significance. Gum rosin and essential oils grew rapidly in 1974 and should continue. Textiles, clothing, bristles, feathers, and down will maintain a strong showing. Americans continue to enjoy Chinese artworks and antiques, but fireworks, a perennial leader, have declined, in part owing to problems meeting new U.S. safety standards. Petroleum exports to the United States do not appear to be a factor although U.S.-owned oil companies may buy Chinese oil for distribution in East Asia. American importers will continue to attend the Fairs in Canton in substantial numbers.

The Chinese trade deficit with the United States will be sharply reduced in 1975, running perhaps $100 million. The deficit is likely to continue, its future magnitude being governed primarily by the size of Chinese agricultural purchases in the United States.

Perspective

The issues and problems confronting the Sino-American relationship have been enumerated and the possibility for growth in trade evaluated. The prospects are positive and not at all bleak, but it seems worth reminding ourselves that of the principal nations of the world probably none is closer to economic self-sufficiency than China. At the same time, Chinese ideology coupled with the planning of a centrally controlled economy and a deliberate government policy of being highly self-reliant injects a political element into commercial relationships to a degree seen few places elsewhere in the world.

The centralized management of foreign trade insures its subordination to political needs where necessary while still providing a mechanism for viable trade under the quite different conditions of commerce prevailing in market and centrally planned economies. The resultant trading system, unique to the PRC although with some similarities to those in Eastern Europe and the Soviet Union, has enabled the Chinese to consistently retain the initiative in the commercial relationship.

Americans should be quick to realize that China is not a market for 50 million automobiles or refrigerators, but a highly selective one dependent on the dictates of Peking's planning. To the extent the PRC chooses to emphasize rapid, rational economic growth in the years ahead, the market for some American products, particularly those of a more advanced technological nature, appears good. To be successful, and there are successful American businessmen in the China trade, one requires large amounts of patience and a fine appreciation of Chinese decisionmaking and commercial practice.

APPENDIXES

THE SHANGHAI COMMUNIQUE

SHANGHAI, February 27, 1972.—Following is the text of the communique issued today at the conclusion of the meetings between President Nixon and Premier Chou En-lai:

"President Richard Nixon of the United States of America visited the People's Republic of China at the invitation of Premier Chou En-lai of the People's Republic of China from February 21 to February 28, 1972. Accompanying the President were Mrs. Nixon, U.S. Secretary of State William Rogers, Assistant to the President Dr. Henry Kissinger, and other American officials.

"President Nixon met with Chairman Mao Tse-tung of the Communist Party of China on February 21. The two leaders had a serious and frank exchange of views on Sino-United States relations and world affairs.

"During the visit, extensive, earnest, and frank discussions were held between President Nixon and Premier Chou En-lai on the normalization of relations between the United States and the People's Republic of China, as well as on other matters of interest to both sides. In addition, Secretary of State William Rogers and Foreign Minister Chi Peng-fei held talks in the same spirit.

"President Nixon and his party visited Peking and viewed cultural, industrial, and agricultural sites, and they also toured Hangchow and Shanghai where, continuing discussions with Chinese leaders, they viewed similar places of interest.

"The leaders of the People's Republic of China and the United States of America found it beneficial to have this opportunity, after so many years without contact, to present candidly to one another their views on a variety of issues. They reviewed the international situation in which important changes and great upheavals are taking place and expounded their respective positions and attitudes."

The United States side stated:

"Peace in Asia and peace in the world requires efforts both to reduce immediate tensions and to eliminate the basic causes of conflict. The United States will work for a just and secure peace: just, because it fulfills the aspirations of peoples and nations for freedom and progress; secure, because it removes the danger of foreign aggression. The United States supports individual freedom and social progress for all the peoples of the world, free of outside pressure or intervention.

"The United States believes that the effort to reduce tensions is served by improving communications between countries that have different ideologies so as to lessen the risks of confrontation through accident, miscalculation, or misunderstanding. Countries should treat each other with mutual respect and be willing to compete peacefully, letting performance be the ultimate judge. No country should claim infallibility and each country should be prepared to reexamine its own attitudes for the common good.

"The United States stressed that the peoples of Indochina should be allowed to determine their destiny without outside intervention; its constant primary objective has been a negotiated solution; the eight-point proposal put forward by the Republic of Vietnam and the United States on January 27, 1972, represents the basis for the attainment of that objective; in the absence of a negotiated settlement the United States envisages the ultimate withdrawal of all U.S. forces from the region consistent with the aim of self-determination for each country of Indochina.

"The United States will maintain its close ties with and support for the Republic of Korea. The United States will support efforts of the Republic of Korea to seek a relaxation of tension and increase communications in the Korean Peninsula. The United States places the highest value on its friendly relations with Japan; it will continue to develop the existing close bonds. Consistent with the United Nations Security Council Resolution of December 21, 1971, the United States favors the continuation of the cease-fire between India and Pakistan and the withdrawal of all military forces to within their own territories and to their own sides of the cease-fire line in Jammu and Kashmir; the United States supports the right of the peoples of South Asia to shape their own future in peace, free of military threat, and without having the area become the subject of big-power rivalry."

The Chinese side stated:

"Whenever there is oppression, there is resistance. Countries want independence, nations want liberation, and the people want revolution—this has become the irresistible trend of history. All nations, big or small, should be equal; big nations should not bully the small and strong nations should not bully the weak. China will never be a superpower and it opposes hegemony and power politics of any kind.

"The Chinese side stated that it firmly supports the struggles of all oppressed people and nations for freedom and liberation and that the people of all countries have the right to choose their social systems according to their own wishes and the right to safeguard the independence, sovereignty, and territorial integrity of their own countries and oppose foreign aggression, interference, control, and subversion. All foreign troops should be withdrawn to their own countries.

"The Chinese side expressed its firm support to the peoples of Vietnam, Laos, and Cambodia in their efforts for the attainment of their goals and its firm support to the seven-point proposal of the Provisional Revolutionary Government of the Republic of South Vietnam and the elaboration of February this year on the two key problems in the proposal, and to the Joint Declaration of the Summit Conference of the Indochinese Peoples.

"It firmly supports the eight-point program for the peaceful unification of Korea put forward by the Government of the Democratic People's Republic of Korea on April 12, 1971, and the stand for the abolition of the 'U.N. Commission for the Unification and Rehabilitation of Korea.' It firmly opposes the revival and outward expansion of Japanese militarism and firmly supports the Japanese people's desire to build an independent, democratic, peaceful, and neutral Japan. It firmly maintains that India and Pakistan should, in accordance with the United Nations resolutions on the India-Pakistan question, immediately withdraw all their forces to their respective territories and to their own sides of the cease-fire in Jammu and Kashmir and firmly supports the Pakistan Government and people in their struggle to preserve their independence and sovereignty and the people of Jammu and Kashmir in their struggle for the right of self-determination.

"There are essential differences between China and the United States in their social systems and foreign policies. However, the two sides agreed that countries, regardless of their social systems, should conduct their relations on the principles of respect for the sovereignty and territorial integrity of all states, non-aggression against other states, noninterference in the internal affairs of other states, equality, and mutual benefit, and peaceful coexistence. International disputes should be settled on this basis, without resorting to the use or threat of force. The United States and the People's Republic of China are prepared to apply these principles to their mutual relations."

With these principles of international relations in mind the two sides stated that:

"Progress toward the normalization of relations between China and the United States is in the interests of all countries.

"Both wish to reduce the danger of international military conflict.

"Neither should seek hegemony in the Asia-Pacific region and each is opposed to the efforts by any other country or group of countries to etablish such hegemony; and

"Neither is prepared to negotiate on behalf of any third party or to enter into agreements or understandings with the other directed at other states.

"Both sides are of the view that it would be against the interests of the peoples of the world for any major country to collude with another against other countries, or for major countries to divide up the world into spheres of interest.

"The sides reviewed the long-standing serious disputes between China and the United States."

The Chinese side reaffirmed its position: "The Taiwan question is the crucial question obstructing the normalization of relations between China and the United States; the Government of the People's Republic of China is the sole legal government of China; Taiwan is a province of China which has long been returned to the motherland; the liberation of Taiwan is China's internal affair in which no other country has the right to interfere; and all U.S. forces and military installations must be withdrawn from Taiwan. The Chinese government firmly opposes any activities which aim at the creation of 'one China, one Taiwan,' 'one-China, two governments,' 'two China' and 'Independent Taiwan' or advocate that 'the status of Taiwan remains to be determined.' "

The U.S. side declared: "The United States acknowledges that all Chinese on either side of the Taiwan Strait maintain there is but one China and that Taiwan is a part of China. The U.S. Government does not challenge that position. It reaffirms its interest in a peaceful settlement of the Taiwan question by the Chinese themselves. With this prospect in mind, it affirms the ultimate objective of the withdrawal of all U.S. forces and military installations on Taiwan as the tension in the area diminishes."

The two sides agreed that it is desirable to broaden the understanding between the two peoples. To this end, they discussed specific areas in such fields as science, technology, culture, sports, and journalism, in which people-to-people contacts and exchanges would be mutually beneficial. Each side undertakes to facilitate the further development of such contacts and exchanges.

Both sides view bilateral trade as another area from which mutual benefits can be derived, and agree that economic relations based in equality and mutual benefit are in the interest of the peoples of the two countries. They agree to facilitate the progressive development of trade between their two countries.

The two sides agree that they will stay in contact through various channels, including the sending of a senior U.S. representative to Peking, from time to time for concrete consultations to further the normalization of relations between the two countries and continue to exchange views on issues of common interest.

The two sides expressed the hope that the gains achieved during this visit would open up new prospects for the relations between the two countries. They believe that the normalization of relations between the two countries is not only in the interest of the Chinese and American peoples but also contributes to the relaxation of tension in Asia and the world.

President Nixon, Mrs. Nixon, and the American party express their appreciation for the gracious hospitality shown by the government and people of the People's Republic of China.

The White House Communique—United States-People's Republic of China

February 22, 1973.

Dr. Henry A. Kissinger, Assistant to the U.S. President for National Security Affairs, visited the People's Republic of China from February 15 to February 19, 1973. He was accompanied by Herbert G. Klein, Alfred Le S. Jenkins, Richard T. Kennedy, John H. Holdridge, Winston Lord, Jonathan T. Howe, Richard Solomon, and Peter W. Rodman.

Chairman Mao Tse-tung received Dr. Kissinger. Dr. Kissinger and members of his party held wide-ranging conversations with Premier Chou En-lai, Foreign Minister Chi Peng-fei, Vice Foreign Minister Chiao Kuan-hua, and other Chinese officials. Mr. Jenkins held parallel talks on technical subjects with Assistant Foreign Minister Chang Wen-chin. All these talks were conducted in an unconstrained atmosphere and were earnest, frank, and constructive.

The two sides reviewed the development of relations between the two countries in the year that has passed since President Nixon's visit to the People's Republic of China and other issues of mutual concern. They reaffirmed the principles of the Joint Communique issued at Shanghai in February 1972 and their joint commitment to bring about a normalization of relations. They held that the progress that has been made during this period is beneficial to the people of their two countries.

The two sides agreed that the time was appropriate for accelerating the normalization of relations. To this end, they undertook to broaden their contacts in all fields. They agreed on a concrete program of expanding trade as well as scientific, cultural, and other exchanges.

To facilitate this process and to improve communications, it was agreed that in the near future each side will establish a liaison office in the capital of the other. Details will be worked out through existing channels.

The two sides agreed that normalization of relations between the United States and the People's Republic of China will contribute to the relaxation of tension in Asia and in the world.

Dr. Kissinger and his party expressed their deep appreciation for the warm hospitality extended to them.

Joint Communique—United States-People's Republic of China

Peking, *November 29, 1974.*

Dr. Henry A. Kissinger, U.S. Secretary of State and assistant to the President for National Security Affairs, visited the People's Reublic of China from November 25 through November 29, 1974. The Chinese and United States sides held frank, wide-ranging and mutually beneficial talks. They reaffirmed their unchanged commitment to the principles of the Shanghai Communique. The two governments agreed that President Gerald R. Ford would visit the People's Republic of China in 1975.

LEGAL AND PRACTICAL PROBLEMS IN THE CHINA TRADE

By EUGENE A. THEROUX*

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I. Introduction

After nearly a quarter century of commercial estrangement, the United States and China are trading again. But the record of this trade over the last 3 years, and the current opportunities and obstacles, augur an uncertain growth in the level and the nature of Sino-American commerce.

Since the Shanghai Communique of February 1972, trade volume first bounded above ceilings forecast by the most optimistic analysts. It has now begun to fall back. Apprehensions that China would flood our markets with inexpensive goods have proven mistaken; expectations that China would be an inexhaustible market for American goods and know-how are proving illusory; and confidence that a common desire to do so would readily solve problems inherent when systems so different come together in commerce has been somewhat shaken. In the new United States-Sino commerce, traders on both sides have often learned that the achievement of a single step must begin with a journey of 10,000 miles.

Difficulties are of course to be expected in the nascent United States-China trade. Aside from the fundamental principles of China's foreign trade, that it would be conducted on the basis of "equality and mutual benefit," and "helping to meet each other's needs," there are numerous business practices with which American businessmen cannot come to easy understanding, appreciation or agreement. The Chinese, too, face in the American entrepreneur, whether importer or exporter, a character for which contact with European traders has only partly prepared them.

This paper is intended to summarize the principal agencies and instrumentalities on both sides which bear upon commerce between the two countries, to review legal and practical impediments to expanded trade, and to offer for consideration some suggestions for facilitation of bilateral trade more accelerated than the "step-by-step" progress to which both sides pledged themselves in the Joint Communique at Shanghai. Insofar as the following material reflects the actual experiences, achievements as well as frustrations, observed in Sino-U.S. trade, it is but a "worm's eye view," yet only by confronting the small realities can the two sides pursues an informed trade policy.

II. Organization and Function of China's Foreign Trade Apparatus

Economic Plans and Foreign Trade Policy

The most populous nation on earth has by far the fewest "businessmen." Foreign trade in China is a monopoly of the state, and is conducted principally through eight foreign trade corporations (FTC's). Neither manufacturing units nor end-user entities in China conclude contracts with foreign individuals or firms; instead, the FTC's act as their agents in both import and export transactions. This is the first and most important fact to be grasped by American firms interested in doing business with China.

The FTC's carry out a trade plan under the guidance of the Ministry of Foreign Trade, aided in part by the China Council for the Promotion of International Trade (CCPIT). In addition to headquarters at Peking, the Foreign Trade Ministry maintains local bureaus in major Chinese cities, and the FTC's and the CCPIT likewise have local branches and offices in certain major cities.

The ultimate blueprint and authority for the import and export contracts executed by the FTC's are China's national economic plans. Peking's Fourth Five-Year Plan continues through 1975; the Fifth Five-Year Plan begins in 1976.

In his speech to the Fourth National People's Congress in January 1975, Premier Chou En-lai announced that the Fourth Five-Year Plan would be fulfilled, and that the State Council would formulate "a long-range Ten-Year Plan, Five-Year Plans, and Annual Plans" in order "to accomplish the comprehensive modernization of agriculture, industry, national defense, and science and technology before the end of the century."

More than a few American businessmen have been puzzled by the fact that the elaborate import and export plans developed by the Chinese, like China's Five-Year Plans, are State secrets. No substantive details of these plans are ever released, and general plan outlines can only be divined by very close attention to official statements and policy pronouncements emanating from Peking and, to some extent, by analysis of trade and business data made public by China's trading partners. The official report of the Tenth Party Congress, for example, contained not one sentence on the subject of foreign trade, and officially reported production and trade achievements are invariably expressed in percentage increase rather than absolute terms.

It may be understandable that Peking is reluctant, for strategic reasons, to publish import and export plans, but foreign businessmen point out that at least a selective release of import needs, or an invitation to submit proposals and bids, and announcements of goods available for export, could enable the Chinese to buy and sell at more favorable prices and terms.

Among the most recent major statements of China's foreign trade policy appeared in an article by Trade Minister Li Chiang appearing in the periodical *China's Foreign Trade*. This publication, resurrected in 1974 after a long absence, appears in several languages and is, therefore, obviously intended for foreign consumption. The lead article, by the Minister of Foreign Trade, offers a good illustration of China's reluctance to publish trade data. Import and export volume is discussed not in absolute terms, but as percentages of base years for which no Chinese-source data exist. Thus, for example, total export-import volume for 1973 is reported to be "2.5 times that of 1965" with exports 2.50 times greater and imports at 2.45 times higher than in 1965.

Trade Minister Li's article is also instructive for the broad policy guides it sets forth. In the absence of other kinds of information, American businessmen are wise to heed these general remarks, which not only embody current trade principles, but which, despite intentional ambiguity, do illuminate the factors at work influencing the trade policymakers. Li quotes from the pronouncement of Mao Tsetung almost invariably cited in official statements about China's trade:

> The Chinese people wish to have friendly cooperation with the people of all countries and to resume and expand international trade in order to develop production and promote economic prosperity.

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In pursuing international trade, China seeks "to learn from other countries' merits and obtain necessary materials, equipment, and techniques through exchange." As if to anticipate and deflect criticism from elements at home fearful of undue dependence on the outside world, Li explains that this "is an implementation of the principle of making foreign things serve China, and combining learning with inventing in order to add to our ability to build socialism independently and with the initiative in our own hands through self-reliance to speed up the pace of our socialist construction. Facts prove," Li states, "that foreign trade is necessary to the development of our national economy."

The justification for foreign trade thus established, Li emphasizes that the New China will not succumb to the encroachments of foreign enterprise which afflicted old China:

> We resolutely oppose the policy of plundering the natural resources of other countries, dominating their national economies and interfering in their internal affairs * * * socialist China will never try to attract foreign capital or exploit domestic or foreign natural resources in conjunction with other countries.
>
> She will never go in for joint management with foreign countries, still less grovel for foreign loans.

But, while China will adhere to the policy of maintaining independence, keeping the initiative in its own hands and relying on its own efforts in socialist construction, "under no circumstances does (this) mean pursuing a 'closed-door' policy." This principle was reaffirmed at the National People's Congress in January 1975.

The Chinese, in trade as in other matters, unhesitatingly concede "shortcomings and deficiencies," acknowledge that theirs is a "developing country, as yet backward in many fields." Assuring the outside world of a determination to broaden foreign trade, the Trade Minister has offered exporters to China the assurance that "China's imports will be increased," and holds out to importers the expectation that "we will gradually be able to export more and better goods to meet the requirements of the people of other countries." Responding to criticisms which Americans, and no doubt others, have made about current Chinese export goods, pledges are more and more frequently found in Chinese statements to increase the quantity, quality, packing, packaging, designs, and varieties of such products.

The Ministry of Foreign Trade

Under the supervision of the Staff Office of Finance and Trade of the State Council, the Ministry of Foreign Trade formulates an overall import and export plan to be used as a basis for specific planning by the FTC's and other agencies with collateral foreign trade responsibilities. After review and approval by the Trade Ministry of their specific import-export plans, the FTC's carry out, under Ministry supervision, their individual trade plans.

The job of the Ministry of Trade cannot be an easy one. China, like the United States, is not by tradition or by need a trading nation. Trade occupies only a small fraction of its gross national product. Aside from some limited trade undertaken to achieve foreign policy goals, the motivation to trade is essentially limited to the need to generate foreign exchange sufficient to finance needed agricultural and industrial imports. There is no "profit motive" which, for example, has made Japan such an aggressive and adaptable participant in the world of international business. On the contrary, there governs China's trade a Marxist-Leninist-Maoist ideology which curbs not only mercantile tendencies, but which requires sound ideological justification as a predicate for commercial decisions. The needs of socialist construction dictate a need for foreign exchange; a need which is more pressing because of a fiscally conservative anticredit policy. Foreign exchange thus comes to China primarily from exports, but the reality of international trade is, at base, competition for the foreign consumer dollar, a competition in which innovation, compromise, flexibility, and even salesmanship, somewhat anathema to Marxist orthodoxy, are essential. It is with such realities that economic plans for trade expansion and increased hard currency earnings collide.

The Ministry of Foreign Trade is organized into eight bureaus. Of these, five have geographic responsibility, the others handle import, export, and planning matters respectively. In addition to administrative offices, the Ministry oversees customs, commodities inspection of imports and exports, a training school for foreign trade personnel, a market study institute, the eight FTC's and other trade-related agencies.

In function, the Ministry is not dissimilar to foreign trade ministries in other socialist countries. It is involved in the appointment of commercial counselors abroad and is the agency for the conclusion of trade agreements and exchanges with other nations.

The China Council for the Promotion of International Trade

Aiding the Ministry of Trade is an organization known as the China Council for the Promotion of International Trade (CCPIT). The CCPIT, founded in 1952, is described in China's publications variously as "a permanent agency performing duties similar to those of Chambers of International Commerce in other countries." It has been described by its leadership to this writer as "a people-to-people organization, not a governmental organization;" without its own sources of income, however, it can only be financed through an appropriation by the Chinese Government. Whatever its charter, which remains secret, it seems clear that the CCPIT is governed today by persons from the eight FTC's, the Ministry of Foreign Trade, and the Ministry of Foreign Affairs, who, acting as a kind of board of directors, meet periodically to review and formulate plans and activities.

A permanent staff, supervised by a Chairman, four Vice Chairmen, a Secretary-General and Deputy Secretary-General, consists of six major departments in addition to units responsible for administration and research. These are:

Legal Affairs Department, which advises the CCPIT's Foreign Trade Arbitration Commission and Maritime Arbitration Commission; informs the FTC's and other trade agencies trade-related about legal developments and requirements abroad; analyzes foreign contracts, laws, and regulations having an impact on China's trade; and oversees registration of foreign trademarks.

Department for Average Adjustment, which administers the Provisional Rules for General Average Adjustment promulgated by the CCPIT on January 1, 1975.

Liaison Department, which sends and receives foreign trade delegations and maintains contact with trade associations in other countries.

Foreign Exhibitions in China Department, which assists foreign countries, associations, and companies in staging trade exhibitions and technical symposia in China. Between 1972 and 1975 alone, there have been more than 30 such exhibitions in China. Usually these are held in Peking, but they have also occurred in Shanghai and Tientsin.

Overseas Exhibitions Department, which is responsible for organizing China's trade exhibitions abroad. In the last 2 years, the Chinese have staged or taken part in some 70 trade fairs or exhibitions abroad.

Publicity Department, which publishes a variety of periodicals describing China's economy and foreign trade.

Despite the independent status claimed for it, it can be safely assumed that no significant activity is undertaken by the CCPIT without the prior approval or direction of the Chinese Government as expressed through the relevant ministries. This is to be expected in part because it is the CCPIT which is the main commercial link to countries, like the United States, which do not enjoy diplomatic relations with China. Indeed, the CCPIT has in the past signed, in its own name, trade accords of commercial consequence with foreign trading firms or trade associations semigovernmental or private in character. The CCPIT also plays some part, though its extent is unclear, in the organization and conduct of the twice-yearly Chinese Export Commodities Fair at Kwangchow (Canton).

Wang Yao-ting, the current Chairman of the CCPIT, and a former high official of the China National Textile Import and Export Corp., wrote in Peking Review in October 1974, of China's trade policies and achievements. Wang placed stress on another theme which not only recurs in China's trade pronouncements, but which remains today at the heart of the organization and conduct of China's trade. "In the century and more before liberation," he says, "imperialist countries imposed by armed force on the Chinese people unequal treaties by which they got from China the privilege of dumping goods, plundering industrial materials, and exporting capital." He recalled that in the century before 1949 foreign interests "dominated China's important trading ports, customs, finance, insurance, and navigation" and "engaged in prolonged, harsh exploitation and plunder of the Chinese people, bringing great damage to old China's national economy and untold suffering to the people." Following the dictum of Chairman Mao Tse-tung that "the restoration and development of the national economy of the people's republic would be impossible without a policy of controlling foreign trade" New China has now, Wang said, "built up an independent foreign trade serving China's socialist revolution and construction."

China's Foreign Trade Corporations

The actual conduct of China's foreign trade, through a socialist State system deemed essential by Chairman Mao in light of unquestionable and relentless exploitation by foreign powers before 1949, now rests with China's Foreign Trade Corporations.[1] These FTC's at present number eight, seven of which have both import and export jurisdiction. Arranged on a product area basis, they are:

China National Cereals, Oils and Foodstuffs Import and Export Corp.;
China National Native Produce and Animal By-Products Import and Export Corp.;
China National Textiles Import and Export Corp.;
China National Light Industrial Products Import and Export Corp.;
China National Chemicals Import and Export Corp.;
China National Machinery Import and Export Corp.;
China National Metals and Minerals Import and Export Corp.; and
China National Technical Import Corp.

Only the last, the Technical Import Corp., concerns itself solely with imports into China, and its area of interest is confined to complete plants and advanced technology.

The corporate charters of the FTC's, if any, have never been made public. The legal nature of the existence of the FTC's is therefore unclear. What is clear is that the FTC's act as the exclusive agents for China's producing and consuming entities in the sale and purchase of goods with foreign firms. It is an arresting coincidence of history that China's trade in the late 18th century was likewise monopolized, then by eight Chinese merchant firms operating at Canton with the imperial sanction of the Dragon Throne at Peking.

Presumably the FTC's do have some "profit and loss" accountability. Whether they are "legal persons" capable of suing or being sued is somewhat a moot point; there are no civil courts as such in China, and the FTC's maintain no offices or assets abroad. They do act, on occasion, through "agents"—firms in Hong Kong and Macao—which are probably more accurately considered independent contractors.

Contracts concluded with foreign firms do not bear the name of the Chinese commune or factory which has produced goods for export, or Chinese end-users on whose behalf foreign goods or equipment is purchased. Instead, the name of the FTC concerned, or its municipal or regional branch, apears as the Chinese party to the agreement. It is the staff of the FTC, supplemented only when and as necessary by knowledgeable producers, end-users, or technicians, which carries on negotiations with foreign firms and executes contracts.

The Chinese Export Commodities Fair, China's principal export event, is organized and operated in cooperation with the FTC's. And it is at this biannual Fair that the FTC's are seen functioning in the fashion intended for them. FTC representatives from Peking, supplemented by negotiators from the regional and municipal branches, come to Kwangchow (Canton) each spring and fall to sit across the table from foreign traders and negotiate purchases and sales. There is little turnover from Fair to Fair among the senior negotiators, and thus the foreign businessman confronts experienced and resourceful men and women, generally well apprised of international prices, supplies, and other market conditions. Likewise, when negotiations occur between Fairs or in Peking at the head offices of the FTC's, the foreign businessman encounters professional Chinese negotiators.

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[1] A list of China's Foreign Trade Corporations, together with their addresses and areas of product responsibility, appears as Appendix I.

It has been observed by Americans who import from and export to China that, however skillful the Chinese negotiators may be in arriving at contract terms as favorable as possible to the Chinese side, there is little or no "salesmanship" involved. On the selling side, the FTC negotiators are primarily "order takers." Only rarely are there reports of the Chinese making more than a perfunctory effort to interest a prospective buyer in a product in which he has not expressed curiosity. On the buying side, the FTC's seem to proceed in similar fashion; there is keen interest in achieving the best terms for a given item, and some effort to extract from the seller information even about the nature of and price of competitive products. But the advantages inherent in monopoly buying and selling do not appear to be fully utilized and, as critics of Marxist economics have noted, there appears some lost opportunity for commercial gain. This the Chinese might readily concede, explaining that the quest for commercial advantage may motivate a capitalist but not a Communist. But since the Chinese foreign trade apparatus certainly has among its responsibilities the acquisition of the maximum amount of foreign exchange in sales, and expenditures of the minimum in purchasing, more entrepreneurial behavior might be expected.

As would seem obvious, the FTC's are functionally organized first into import and export departments, and then subdivided into units each with responsibility for certain of the many products handled by the corporation as a whole. In addition, there are, within these divisions, departments which are geographically composed, so that expertise can be developed and maintained with respect to the peculiarities of different foreign countries and areas.

Collateral Trade and Related Organizations

In addition to the FTC's, there are other agencies which do not handle the purchase or sale of merchandise but which are nevertheless an integral part of the foreign trade apparatus.[2] These include:

China National Foreign Trade Transportation Corp., which arranges documentation, shipping, and delivery of imported and export goods.

China National Chartering Corp., which charters vessels and books shipping space for Chinese cargoes.

China Commodities Inspection Bureau, which performs final inspection of imported and export goods on behalf of the FTC's to determine whether or not such goods are in conformity with underlying contracts.

Bank of China, which from its head office in Peking and branches abroad, handles all foreign exchanges transactions for China, including international payments and disbursements as required by China's foreign trade corporations.

People's Insurance Co. of China, which underwrites marine, land transportation, air transportation, post, ship's hull, and machinery insurance and reinsurance.

China Insurance Co. Ltd., a joint state-private enterprise, which underwrites marine, fire, life, accident, workmen's compensation, and motor vehicle insurance.

The Tai Ping Insurance Co. Ltd., another state-private enterprise, whose business parallels that of the China Insurance Co.

China National Export Commodities Packaging Corp., created in 1974, which, among other functions, advises the FTC's on packing and packaging requirements of foreign markets.

China Publications Center (*Guozi Shudian*), which handles books, periodicals, phonograph records, and postcards, and functions in particular as the export agent for China's publications in foreign languages.

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[2] These agencies are listed, together with their addresses, as appendix II.

China Film Distribution and Exhibition Corp., which is the sole importer of foreign films and the export agent for Chinese films.

China Stamp Export Co., which is the exclusive agent for the export of Chinese stamps.

Chinese Scientific and Technical Association, which is involved, with the CCPIT, in arranging contacts between China's scientific and technical communities and professional societies and associations abroad.

All of the foregoing agencies are based in Peking and, with the exception of the Packaging Corporation, have branch offices in a number of other Chinese cities. All are likewise represented at the Chinese Export Commodities Fair.

III. The Chinese Export Commodities Fair

In the annals of international trade, it would probably be impossible to find a foreign commercial event which has exerted so magnetic a pull over so great a distance on so many American businessmen as the Chinese Export Commodities Fair, more often referred to as the Canton Fair or Kwangchow Fair.

The Fair has been held twice each year, in the spring between April 15 and May 15 and in the autumn between October 15 and November 15, at Kwangchow (Canton) since 1957. Attendance is by invitation only. Americans were not invited until April 1972, the first Fair following the visit to China by President Nixon in February of that year.

It is estimated by some that, since the 1972 Spring Fair, no fewer than 50,000 U.S. businessmen have sought—unsuccessfully—to gain admission to the Fair. Probably not more than 2 percent of that number have actually attended to date. Yet, enthusiasm has not dimmed, and requests for invitations to forthcoming Fairs are still flowing to Peking.

How Peking Views the Fair

The most authoritative, if brief, explanation of the Fair is provided by the Chinese in a pocket handbook provided free to Fairgoers as they register for the event. It says that the Fair is "jointly sponsored by China's import and export corporations in accordance with the directive of the great leader of the Chinese people, Chairman Mao," once again citing the justification for contact with foreign traders, that "the Chinese people wish to have friendly cooperation with the people of all countries and to resume and expand international trade in order to develop production and promote economic prosperity."

"The Fair," says the handbook "takes the form of combining trade negotiations with the display of exhibits." The FTC's are represented at the Fair by trading delegations, and "on-the-spot business talks are held and transactions against samples concluded between the trading delegations and businessmen from all parts of the world." At the Fair, where Peking does between 35 to 40 percent of its export business annually, "China sells her export commodities and buys what she needs, while views are exchanged for the development of reciprocal trade."

The Fair is not without political content:

> Introduced in each Hall are some of the outstanding deeds performed by the Chinese people as a result of studying and applying Marxism-Leninism-Mao Tsetung Thought in grasping revolution and promoting production. Put on display are a rich and varied range of export commodities and products of successful

achievements from China's various provinces, municipalities, and autonomous regions (with the exception of Taiwan Province), reflecting the new attainments in socialist revolution and construction scored by the Chinese people under the guidance of Chairman Mao's proletarian revolutionary line.

Fairgoers are reminded that:

> Following the daily development of China's socialist construction and the constant development of her foreign relations, the scope of the Fair has continuously expanded. The number of foreign guests visiting the Fair has increased from 1,200 from over 20 countries and regions at the first session of the Fair to more than 26,000 from over 100 countries and regions * * *. The volume of both import and export trade has also increased with each passing year. Since its inauguration, by resolutely carrying out China's foreign trade policy of "equality, mutual benefit and supplying each other's needs," the Fair has promoted normal trade exchange between China and the rest of the world and enhanced mutual understanding and friendship between the Chinese people and the peoples of all countries.

Though the Fair is, as its name suggests, an event designed to sell China's goods and thus earn foreign exchange, it is not an ordinary "profit-motivated" event, as a number of characteristics of the Fair clearly reveal.

Businessmen are put on notice of the political character of the Fair, and of some Fair business decisions, by a quotation from Mao Tse-tung displayed on a large red billboard which, together with a portrait of Chairman Mao, dominates the entrance lobby of the main Fair exhibition hall: "The Theoretical Basis Guiding Our Thinking Is Marxism-Leninism."

The New China News Agency dispatch announcing the opening of the Spring 1975 Fair led with this paragraph, another of many indicators that business is not alone the substance of the Fair:

> China's Export Commodities Fair opened here today as the nationwide movement to criticize Lin Piao and Confucius is deepening and advancing victoriously.

On opening day, red balloons trailed inscribed streamers over the Fairgrounds, but the messages were political, not commercial. Among them: "Resolutely support the just demands of the Third World!," "Long live the victory of the Great Proletarian Cultural Revolution!," and "Long live Marxism-Leninism-Mao Tse-tung Thought!"

At the banquet which closed the Fair, officials summarized the event by announcing that China:

> Will adhere to the principle of independence, initiative and self-reliance, grasp revolution, promote production, and expand our foreign trade on the basis of developing industry and agriculture in a big way, so as to serve China's socialist construction better and contribute to the promotion of friendship between the Chinese people and the people of other countries.

Organization of the Fair

Kwangchow (Canton) today is China's principal trading center, as it has always been so far as Western traders are concerned. Though the historic city has over time permitted the introduction of foreign goods into China, it has principally been an outlet for Chinese merchandise. And it is so today.

Recent American visitors to the Fair have discovered, as their forebears did, that their travel in China is essentially confined to Canton. John Paton Davies, writing of another era, says that:

China humored the seaborne barbarians to the extent of tolerating foreign merchants at one port only, Canton. It was the tradesman's entrance, where they were treated as disreputable peddlers, not permitted to cross the threshold into the house.

Today foreign businessmen, with a few exceptions, are likewise allowed no further than Canton. Each Fair finds a large number of them, especially Americans, dickering with the Chinese for permission to leave sweltering Canton for sightseeing in Peking or Shanghai. But the Fair is not intended as a tourist attraction. Political overtones notwithstanding, the main emphasis is on selling. And the Chinese have done a great deal to make the businessmen's sojourn in Canton as pleasant as possible.

The Chinese obviously intend to maintain and expand Canton as the prime trading city of the People's Republic. Beginning with the Spring 1974 Fair, the event was moved to an enormous modern complex of buildings, newly constructed, with over 1 million square feet of display area and negotiating rooms at the northern end of the city. At the same Fair, the Chinese opened an 800-room 11-story addition to the Tung Fang Hotel, across the street from the Fair compound, and inaugurated a massive new railroad station which now deposits visitors within a 15-minute walk of the Fair buildings, the Tung Fang Hotel, and two beautiful public parks boasting lakes, boating, swimming, restaurants, and other facilities. The Tung Fang Hotel, in a move almost unthinkable in austere China, now offers an artificial pond with lounge chairs arranged in a secluded garden around it, two bars, a billiard room, a table tennis room, a badminton court, a barber shop, a beauty parlor, a shopping arcade, and a roof garden for the convenience of Fair guests. Business is made easier with the recent introduction at the hotel of telex as well as cable, overseas telephone, banking and postal facilities.

Display areas in the Fair complex, arranged by the foreign trade corporations, beautifully exhibit thousands of varieties of merchandise, from numerically controlled machine tools to frozen foods, from petroleum products to textiles and handicrafts. Access to the Fairgrounds is strictly limited to registered businessmen, identifiable by a pink ribbon bearing the Chinese characters for "Honored Guest."

In addition to the exhibit of goods available for export, numerous displays, consisting of large photographs and massive topographic scale models, show the visitor examples of rural or industrial achievements. Such displays are ordinarily manned by very personable young men and women guides from the area represented in the exhibit. In other areas, workers demonstrate the skills which have made Chinese art objects and handicrafts among the finest in the world.

Weekend excursions are arranged for groups of Fairgoers to visit model factories, communes, schools, hospitals, power stations, and the like. Travel without escort for shopping or sightseeing may be undertaken throughout the city of Canton, without restriction, but special permission must be obtained to go beyond the city limits. So complete are the services and amenities available within walking distance of the Fair, however, that many guests never venture into the city proper.

The business aids available at the Tung Fang Hotel (and other major hotels in the city used by Fairgoers) are also available at the Fair compound itself. Telex, cable, overseas telephone, typewriters, banking, post office, insurance, shipping, and customs services are all provided for the foreign trader. A cinema, garden, restaurant, and retail stores round out the amenities at the Fairgrounds.

Actual business at the Fair is transacted mostly in private discussion rooms on floors above the exhibit areas, though owing to lack of space even in this large complex some contract negotiation occurs at tables in display areas essentially without privacy and occasionally in the presence of competing business representatives.

A permanent secretariat based in Canton throughout the year conducts logistic planning between Fairs, and carries on the day-to-day business of Fair organization and operation. Opening and closing days of the Fair are marked with earshattering fireworks displays, specially lighted streets and buildings, and mass banquets, the largest of which is held at the Tung Fang Hotel where several thousand guests are addressed, usually by a Vice Minister of Foreign Trade. Throughout the Fair, Canton's restaurants and other public places are bedecked with signs or streamers extending "Warm Welcome to the Guests of the Chinese Export Commodities Fair." Students from China's foreign language institutes appear in the city, where the best of them are utilized as interpreters in business discussions and those with less experience are employed as hotel and restaurant workers.

The Fair, then, serves primarily as China's sales outlet to the world. Secondarily it is a showcase of socialist achievement, not only to the West and to the Third World, but also to China's own citizens who may occasionally be seen in special groups moving through the complex. Finally, the Fair localizes commercial activity with foreigners as to time and place, and permits a relatively orderly conduct of trade.

Business Aids at the Fair

Even with the banking and communications facilities described earlier, the American at the Fair is without tools most consider customary if not necessary in the conduct of international business.

Secretarial service is unavailable, and senior executives who deem it essential that they, rather than subordinate buyers, attend the Fair and place orders have found themselves perspiring over telex keyboards and punching tapes, slowly agonizing over a letter at a time. Telex channels are so limited relative to the number of users that the instruments cannot be employed in the manner which makes them most efficient. That is, a sender is not permitted to keep a channel open in order to converse with the home office; he may only send, and keep the line open only long enough to receive immediately at the conclusion of his transmission a reply to his previous message. This requires advance communications planning and coordination which Fair regulars alone have mastered.

Foreign exchange may be converted into Renminbi, the Chinese currency, without difficulty. But if a visitor is caught short, without Chinese or foreign currency, or acceptable travelers checks, he will discover that no credit cards are honored (other than international telecommunications cards), nor are personal checks accepted in payment of anything, anywhere, without a delay of 7 to 10 days at best for clearance through Hong Kong. Anticipating possible shortages of funds, experienced Fairgoers have resorted either to maintenance of local non-interest-paying deposit accounts with the Canton Branch of the Bank of China, into which funds may be cabled from abroad, or, perhaps more conveniently, travelers letters of credit issued by the Bank of China's Hong Kong Branch (or other acceptable banks) which may be redeemed in needed amounts, up to the face value of the letter, in Canton or at the Bank's branches in other Chinese cities.

Transportation to Canton, for most Fairgoers, is via Hong Kong, by train to the New Territories border village of Lowu, then by foot through a covered bridge spanning the border, to the Chinese village of Schumchun for a second train ride from there to Canton. The total trip of some 90 miles takes about 7 hours, depending upon the number of travelers, which includes passport, customs, and immigration stops at each side and a luncheon on the Chinese side prior to the rail trip to Canton. Arrangements for travel into China are handled in Hong Kong by China Travel Service (H.K.) Ltd., an independent concern which acts for China International Trade Service (CITS), the official travel service of the People's Republic of China. The return trip for most is by the same route, arrangements being made this time by CITS in Canton. With the inauguration of air service between Tokyo and Shanghai, air connections are now possible to Canton for trans-Pacific travelers, though it is expected that most Fair guests will continue to reach Canton by rail from Hong Kong.

Except for purchase of train tickets in Hong Kong for the trip to Canton the Fair visitor directly handles none of his travel arrangements in China. No air or rail passage can be booked except in person through the CITS officers at the Fair hotels, This, too, of course, is a departure from the norm for most American businessmen, who are accustomed to making plane or train reservations independently with the relative ease of a phone call or two.

To help the visitor through what on a bad day can be a formidable bureaucratic maze, the Fair authorities maintain in each major hotel a Liaison Office with a multilingual staff. With very rare exception, these young men and women are cheerful, courteous, and helpful in assisting with necessary travel arrangements, Fair appointments and many other matters.

Supplementing the assistance provided by the Chinese are two additional sources of help and advice upon which American visitors at Fairs since 1973 have come to depend. One is an office manned throughout the Fair by representatives of the National Council for United States-China Trade (National Council), the other is the availability during the Fair of commercial officers detailed from the U.S. Liaison Office at Peking. Both maintain regular office hours in the Tung Fang Hotel, across the street from the Fair.

The National Council's facilities offer electric typewriters, a photocopier, a library of tariff and trade periodicals, including U.S. Tariff Schedules and relevant Food and Drug, Customs, Federal Trade Commission, and Department of Agriculture regulations. Both the National Council's China trade specialists and the commercial officers from the U.S. Liaison Office are available for private consultations with American businessmen as specific questions or difficulties arise. And it is through the good offices of these individuals that informal contacts are often initiated with officials of the Fair and the FTC's.

Participation at the Fair

Attendance at the Fair is limited to representatives of business firms in market economies. Peking's trade with the Soviet Union and East Europe is conducted on a State-to-State basis, and these countries are represented at the Fair, if at all, only by commercial counselors posted at Peking who stop by Canton at Fair time for opening or closing ceremonies.

The total attendance figures, usually in the neighborhood of some 25,000 for recent Fairs, given out by Fair authorities are somewhat misleading. Not all such visitors do business. Included in that figure appear to be trade and other fraternal delegations, visitors to China for nonbusiness reasons whose travel to Canton coincides with the Fair, and a substantial number of local Chinese workers, peasants, and soldiers invited to circulate through the Fair. In all, there are perhaps no more than 9,000 attendees who actually transact business at the Fair.

Aside from one or two U.S. citizens of Chinese heritage known to have attended the Fall 1971 Fair, no Americans attended until about 40, including Senate leaders Mike Mansfield and Hugh Scott, were invited to the Spring 1972 event, following the historic Joint Shanghai Communique of February that year. Step-by-step increases in U.S. participation followed, as some 60 firms were invited to the Fall 1972 Fair, 80 to the Spring 1973 Fair, 100 to the Fall 1973 Fair, 120 in the Spring of 1974 and, owing perhaps to a sagging world economy which cut attendance from other countries, an increase only to an estimated 175 firms invited to the Fall 1974 Fair. About 225 U.S. companies attended the Spring 1975 Fair. Actual attendance by individual Americans has ranged from 30 to 50 percent above the numbers just given, since wives and business colleagues are sometimes included on the one invitation extended to a given firm.

The largest group at the Fair, after a contingent of some 5,000 Hong Kong traders, has traditionally been the Japanese. After having representatives in the neighborhood of some 2,500 at each Fair the last 3 or 4 years, Japanese attendance fell to close to or below 2,000 at the Spring 1975 Fair, while U.S. individuals in attendance, which passed 450, made Americans the second largest national group after the Japanese in Canton. Not surprisingly, economically hard hit countries like Italy saw their attendance drop sharply at the 1975 Spring Fair. The fact that, whatever its troubles, the U.S. economy is relatively better off than most any other in the industrialized world, may well mean that measurably more invitations will be extended to U.S. firms for forthcoming Fairs. Indeed, Americans went against a downturn at the Spring 1975 Fair and did a record $55 to $60 million worth of business.

Unlike trade shows elsewhere around the world, one cannot simply decide to attend the Fair and then make arrangements to go. The Fair, as noted earlier, is by invitation only. Indeed, no travel of any kind may be undertaken to China unless there is a ready host at that end. In the case of the Fair, invitations are extended by the Chinese Export Commodities Fair itself, and a recipient never really knows for certain why or by whom he was selected. It seems rather sure, however, that each FTC is allocated a certain number of invitations, and these are extended, naturally, to those firms that FTC considers to be live prospects for business. Queries by Americans for Fair invitations, without a compelling showing of genuine interest and capacity for business, are very likely to go unanswered.

One experienced trader commented after the autumn 1974 Fair—considered by most to be a disappointing one for the Chinese—that he felt the best way to get an invitation to the next Fair would be to "write to Peking and tell them you want to buy handicrafts." He was not being entirely facetious. The person who wants to buy what China wants to sell is a natural potential invitee. The problem for Americans eager to go has been difficulty in communicating their readiness and willingness to buy to the Chinese.

The most surefire way yet found to secure an invitation has been to show an interest in buying by actually buying, in advance of the Fair. No case is known in which a firm who placed and paid for an order prior to a Fair was not, if it wished, invited to the Fair which followed. Firms which, because of the nature of the products in which they have an interest, cannot place such orders, have had success in simply writing to the appropriate FTC in Peking a letter which:

Clearly states the reason for writing, e.g., that the letter is a request for invitation to Fair for the purpose of making purchases.

Describes the company, including briefly its history and record of growth.

Gives recent sales volume by type of goods handled, including current sources of supply.

Describes the size and scope of the company's activity relative to that of other firms in the industry.

Stresses unique practices or capabilities of the company, citing ways in which these features can be especially important in bringing Chinese goods successfully into the U.S. market.

Furnishes background information on officers, directors, or buyers of the company who will, if invited, go to the Fair.

States a willingness to exchange views, information, and advice on methods by which Chinese goods might be fabricated, styled, and shipped to improve marketability in the United States.

Copies of such letters, or similar representations to the Commercial Staff of the Liaison Office of the People's Republic of China in Washington, may also have the desired effect, since this office is, among other things, charged with locating reliable U.S. firms for Fair invitations. Member firms of the National Council for United States-China Trade, too, have something of an advantage, since it is known that the Chinese solicit suggestions of prospective invitees from the organization.

Contract Negotiation at the Fair

In China as elsewhere, no business transpires until the agreement of the parties has been reduced to writing. The process by which foreign businessmen and Chinese negotiators at the Fair proceed toward a final contract, however, and the agreement to which they finally give mutual assent, have characteristics unique to the China trade. What follows are general findings which, of course, admit of exceptions in particular cases.

In a typical transaction, the American businessman new to the Fair will begin by going to the FTC discussion area of interest to him within the Fairgrounds. There he presents his business card to any one of a number of Chinese officials going to and fro, none of whom are identifiable by name, rank, or function. He will be asked what country he is from, whether he wants to buy or sell, the commodity and then will be asked to be seated in the hallway. Shortly thereafter, he will be approached and informed of the time and place of his first meeting. Ordinarily, it will be for a day or two later, unless the FTC is not too pressed or if the businessman successfully insists upon an earlier meeting owing to a tight travel schedule, in which case he may be accommodated that same day.

First meetings have an almost ritual format. The discussion room is bare except for a table with two or three chairs along each side. The Chinese are seated on one side, and indicate the visitor is to seat himself opposite. Hot green tea is poured, Chinese cigarettes offered, and the visitor is asked a few general questions, such as whether he has previously visited China, before the Chinese ask about his particular interest and then indicate to him to "please go ahead"—the signal to discourse about his company, his business objectives with that FTC, and so forth. All of his remarks will be carefully taken down in a small notebook by a person on the Chinese side of the table.

Only rarely will the discussion occur solely in the English language. While a number of China's negotiators speak English, even these prefer to carry on the discussion through an interpreter. In practice, this gives each side time to consider statements carefully.

Interpreters are part of the Chinese team; it is unusual for the Fairgoer to have one of his own with him. Chinese interpreters for these meetings are generally very good, as they must be if a contractual meeting of the minds of the parties is to occur. Occasionally, though, discussions are stymied by inadequate interpretation.

American buyers at recent Fairs have often been struck by the essentially passive attitude of Chinese negotiators who, as suggested earlier, function more as order-takers than sales personnel. American buyers have found themselves often forcing the discussion, concerned at the apparent lack of interest displayed by the Chinese side, and occasionally struck by the almost condescending impassivity shown in response to American representations that, for example, given appropriate price and terms, orders of very substantial size may be placed. Americans who tout the amount of business possible in the U.S. market strike many Chinese as impolite if not commercially garrulous. The Chinese, in fact, have shown some sign of overreacting to the big-business puffery of some U.S. importers, and subsequent American buyers are now occasionally troubled with minimum quantity order requirements for U.S. buyers which are quite different from those imposed on traders from other countries.

Well-prepared traders, interested in laying a basis for trust and "mutual benefit" with the Chinese, come to these discussions with information about United States and world market conditions for the commodities under discussion. A buyer who appears without knowledge in his product area, or only grudgingly willing to share his information, forfeits a chance to establish a good working relationship with the Chinese, to whom such a personal relationship counts heavily. Although the Chinese rarely reciprocate with business information they possess.

For their part, Chinese negotiators usually possess very accurate information about world market conditions. They not only have the data which any good professional trader would possess whose sole function is to deal in a relatively specialized range of commodities, but they have the advantage which accrues when and as they are able, in the course of the Fair, to obtain, check and verify market information in discussion with different traders of varying outlook from around the world.

Other Chinese Trade Fairs

In a departure from earlier practice, in which the Chinese Export Commodities Fair alone was the mechanism for export sales, the China National Native Produce and Animal By-Products Import and Export Corp. held two new sales events in early 1975. Between February 25 and March 5, a Carpet Fair was held at Tientsin, and between February 21 and March 2 a Forestal Products Fair was held at Kwangchow. The goods displayed and sold at these two events were no different from those ordinarily handled at the Canton Fair, and since the invitees from abroad were of no special category, it is not known why these events were held or whether they will become regular annual events. Americans in small numbers were invited to both.

IV. Problems in Importing From China

The first American ship to reach the Middle Kingdom, the *Empress of China*, sailed up the Pearl River to Canton in 1784. Endeavoring to explain to the Chinese the difference between themselves and Englishmen, whom the Chinese had some difficulty distinguishing, the Americans aboard, according to their report to John Jay in 1785, "by the map conveyed to them an idea of the extent of our country, with its present and increasing population," adding that the Chinese "were highly pleased at the prospect of so considerable a market for the production of their own empire."

Americans have off and on for 200 years dreamed of capturing even a small part of the vast Chinese consumer market. The fur merchants, chewing tobacco agents, and kerosene sellers of yesterday have their spiritual progeny in the pantyhose, chewing gum, and soft drink salesmen of today. All are mesmerized at the prospect of nearly a billion customers.

It is not surprising, then, that some Chinese may harbor similar hopes about penetrating the American market. After all, no society in the history of the world has had the mammoth potential for China's goods made possible by our huge consumer spending. Sears, Roebuck & Co. alone has annual retail sales well in excess of China's total foreign exports.

In the first 3 years of trade with New China, however, our imports have been modest, to say the least. In 1972, we imported some $32.5 million, in 1973 some $67 million, and in 1974 just over $100 million. From a two-to-one balance in our favor in 1972, however, our exports to China in 1974 exceeded our imports by a factor of some 8-to-1.

This kind of imbalance violates the principle of "equality and mutual benefit" which is central to China's foreign trade policy. We ourselves would find such a disparity unacceptable were we on the short end of such a trade. Chinese officials at the Canton Fair and in Peking, in discussions with commercial visitors from the United States, almost invariably point out that the imbalance is bothersome to them, even though they recognize that it is not really possible to balance trade absolutely equally with each trading partner. The "fault" for the relatively low level of Chinese exports to the United States lies both in Washington and Peking.

Obstacles on the American Side

Without question, the major inhibition to expanded Chinese exports to the United States is the imposition of discriminatory U.S. tariffs. Chinese goods like those of other socialist states, excepting Poland and Yugoslavia, are currently subject to duties at the column II rates of the Tariff Schedules of the United States. These range as much as 100 to 300 percent higher than those assessed on imports from the "most-favored-nations." Children's building blocks imported from Hong Kong or Japan, for example, are charged an ad valorem duty rate of 10.5 percent, but the same blocks coming from China are socked 70 percent ad valorem. Base price advantages available on some Chinese goods are more than wiped out by such staggering levies. These discriminatory duties were originally imposed at the time of the Korean War. As our relations with China have improved, the disparity between most-favored and non-most-favored rates has actually increased, since column I but not column II rates have been reduced as a result of the Kennedy Round international trade negotiations. For a number of reasons, these tariffs are unjustifiable and should be removed:

First, the Shanghai Communique requires good faith efforts by both sides toward removal of trade obstacles. China imposes no such restrictions on imports from the United States, nor any similar barriers, and we should, wherever possible, lead, not retard, the movement toward normalized trade relations with China. The United States reaffirmed its desire to improve trade relations in another joint communique issued at the conclusion of Secretary Kissinger's visit to Peking in November 1973. In that joint statement, the two sides agreed that:

> It is in the interest of both countries to take measures to create conditions for the further development of trade on the basis of equality and mutual benefits.

Second, as a practical matter, China cannot be expected indefinitely to buy from U.S. firms if she is denied reasonable access to our markets. As noted earlier, in 1972 we had a favorable balance of trade with China of nearly two to one. In 1974, we sold China nearly 8 times as much as she sold us. Most-favored-nation access to the United States can help China earn some of the foreign exchange necessary to finance large agricultural and industrial orders American companies are now making, or hoping to make, to China.

Third, China was removed from among our trading partners during the Korean War, 24 years ago, when American and Chinese troops faced each other in combat. We have now returned to peaceful relations, and our foreign trade policy should reflect that fact.

Fourth, China has inexpensive yet high-quality products to offer American consumers. At present, potential consumer savings and consumer choice are effectively nullified by tariff duties. With nondiscriminatory tariff treatment on Chinese imports, American consumers—at a time of sharply rising domestic prices—can have access to less expensive Chinese foodstuffs, wearing apparel, and other consumer goods.

Fifth, the fear expressed by some, that China will compete unfairly in our market, appears unfounded. Australia, Canada, Germany, and Japan, for example, currently admit Chinese goods on a most-favored nation basis and none has experienced difficulty in this respect. Moreover, present legislation provides ample relief measures should imports from China ever cause market disruption and material injury to domestic industries. Similarly, it is most unlikely that China would jeopardize the evolution of important political gains by pursuing unfair trade practices. Our own Department of Commerce has estimated that imports from China would rise only some 15–20 percent should nondiscriminatory status be granted.

Sixth, the United States naturally has among its own interests the desire for reciprocity for tariff concessions, such as agreement on certain commercial practices with our trading partners. A further Sino-American trade agreement can achieve, in addition to most-favored-nation treatment, agreement respecting commercial arbitration, protection of American patents and trademarks, and various trade promotion activities of benefit to both sides.

Seventh, the United States now appears to be pursuing a commendable foreign policy, in pursuit of a stable and peaceful world, which treats the U.S.S.R. and the People's Republic of China evenhandedly. Now that trade negotiations have occurred between the United States and the Soviet Union, similar discussions should be undertaken with China without delay.

Eighth, the view of a few that China should be denied most-favored-nation treatment on strategic grounds is unsound. The Soviet Union is unquestionably more militarily dangerous to our country than is China, and yet this objection has not been seriously raised with respect to the U.S.S.R.

Ninth, failure to achieve nondiscriminatory tariff treatment for China, thereby continuing past the mid-1970's a sanction whose roots are in the Cold War at its coldest, would, in fact, be taking a step backward from hope represented by the Shanghai Communique of 1972. Examining United States-China trade relations from the point of view of the Chinese, rank discrimination is present in our trade relations with them so long as our present tariff policy continues in effect. We are thus open to the criticism that it is the United States, not China, which is impeding progress in our economic relations.

Tenth, good trade relations, conducted on the basis of equality and mutual benefit, can serve the cause of peace. Good commercial relations between the American and Chinese peoples can lead to contact, cooperation, and friendship in other spheres. All of us benefit when the threat of tension, conflict, and war is reduced.

Tariffs are not the only barrier Chinese goods must hurdle on their way to the American consumer. Another vestige of the nearly quarter century of estrangement is the abnormal, more accurately nonexistent, banking relationship between the two countries. There are no legal restrictions imposed by the United States on private financing of trade with China. There do, however, remain outstanding U.S. private claims against China for property seized by Peking in retaliation for U.S. Government confiscation of Chinese assets in American banks at the outbreak of hostilities in Korea. The frozen Chinese assets represent a claim by Peking. Negotiations spanning some 3 years have not yielded a settlement of this matter. Until the issue is resolved by the two countries, China has been unwilling to establish a correspondent relationship with any American bank.

For trade, there are several adverse implications of the private claims-frozen assets problem. Among them are added headaches for U.S. importers which, consequently inhibit Chinese exports to this country. It is not now possible, for example, for a U.S. importer to make payment on his orders for Chinese goods except through third country banks. This adds time and expense to his transactions. Nor may a U.S. importer presently obtain the protection of a forward purchase of Renminbi, as a safeguard against fluctuations of the U.S. dollar, with the result that he really does not know, at the time he signs his Canton Fair contract in Renminbi (the Chinese have only recently relaxed a firm policy requiring payment in RMB) what his order will cost him in U.S. dollars when the time arrives for payment.

Some but not all American banks have made it a practice to absorb or reduce the costs and fees attendant on serving U.S. importers where certain expenses result from using third country banks in what would otherwise be a standard, direct transaction. These complexities and uncertainties in financing United States-China import trade, according to a number of importers, also have made it difficult for them to get operating financing from American banks. This is particularly true of the smaller and newer firms willing to take the risk of introducing Chinese products to the U.S. markets. To avoid the risk of attachment of their ships or cargo by American claimants, the Chinese have not allowed their own flag vessels to call at U.S. ports. The result has been some delays in transshipments which in turn slows and complicates the flow of Chinese exports to this country.

Aside from the foregoing obstacles, Chinese products are subject to the same conditions governing entry of foreign products into the United States. But as a practical matter this does not, at the present time, put China on a par with other exporting countries for the simple reason that insufficient time has passed for the Chinese to grasp and adapt to the full range of our consumer protection and related statutes and regulations. For sheer puzzlement and skepticism, for example, little can match the Chinese reaction to explanations that a toy auto exported to the United States must bear a label "Not recommended for children under 5 years of age," that garments for adults must bear instructions for their care, or that Chinese teacups are inadmissable altogether because they pose a lead-poisoning hazard. Many importers still wonder if they have successfully persuaded the Chinese of the truth of the situation, that Federal regulations apply to all suppliers, foreign and domestic, and are not part of a seamless web of discriminatory nontariff barriers for which China has been singled out. Regulations, procedures, and decisions of the Food and Drug Administration, the Federal Trade Commission, the Department of Agriculture, the

Bureau of Customs, the Bureau of Alcohol, Tobacco and Firearms and the International Trade Commission, not to mention the welter of State and local laws governing goods in commerce, have driven some of our own manufacturers to distraction, and it will likely be some time before China's FTC's adjust to the reality of these nonnegotiable conditions of export to the United States.

In a practical sense, another obstacle to successful exporting to this country is represented by the phenomenon market competition itself holds for an austere, socialist country like China. While it may be an exaggeration to say, as our manufacturers and retailers are fond of insisting, that here "the consumer is king," it is quite true that the range, style, packaging, and labeling of goods, often more than the quality of the product, determine success or failure at the retail level. In this sense, Chinese products are, on the whole, as yet inadequate for measurable penetration of the American market. This reality of our market is one of which the Chinese acknowledge awareness, but the necessary adaptations have yet to be made.

Certain dressed or undressed furs and skins from China—ermine, fox, kolinsky, marten, mink, muskrat, and weasel—are also currently prohibited entry into the United States. Feeble Administration efforts have been made, unsuccessfully, to induce the Congress to end what is now a rather inexplicable sanction on Chinese exports.

Obstacles on the Chinese Side

The problems in increasing Chinese exports to the United States which can be attributed to the other side add up, fundamentally, to a reflection of the inherent limitations of a rigidly planned socialist economy endeavoring to succeed in the markets of the citadel of free enterprise. Some difficulties are inevitable.

China is first among the socialist states, if not among all other nations, as a potential supplier of consumer goods to the United States. She has the combined advantages of abundant raw materials and manpower, low production costs, and the incentive born of foreign exchange requirements. On the other hand, there must be considered against these factors a Marxist economic outlook, inherently antagonistic to the requirements of capitalist markets, a domestic economy of unprecedented austerity, and an autarkic tradition of centuries. So the potential importer from China confronts contradictions.

A seller with China's potential advantages might be expected assiduously to seek out buyers. She does not. The first requirement of the importer, to determine the range, depth, quality, availability, and price of China's products can be met, really, only by a personal journey by himself or an agent to China. Information about raw materials, which can be described in accordance with accepted international standards, of course, may be obtained through an exchange of cables or correspondence with the proper FTC in Peking. But for other products, such as textile piece goods, apparel, and the wide range of light manufactures, which is where China's potential lies, personal inspection is ordinarily essential. While the Chinese are willing to ship samples, the catalogs from which samples may be selected are limited in quantity and scope, and available from Peking, as importers have found, often only after protracted delay.

China maintains no product showroom in the United States, has yet shown no interest in exhibiting products in any of the numerous trade shows here, has neither hired nor authorized representative agents to develop a market for her products, has not engaged any market research organization to obtain product potential data, and has responded to only one of the hundreds of invitations, from importers, trade associations, retail chains, and others, to send commercial visitors to the United States to promote Chinese sales or study the market for Chinese goods. The single trade group from China to visit the United States as of this writing has been a five-member delegation from the China National Textiles Import and Export Corporation which visited present and potential customers during February and March 1975. The group came at the invitation of the National Council for United States-China Trade.

Introduction to Chinese products is, then, done in China on Chinese terms. And those terms generally require a trip to the Canton Fair, where goods for export are displayed and export contracts signed. American requests to meet with factory or FTC branch office personnel have generally (but not always) been refused. Some companies which have done substantial business have been invited to China between Fairs for factory visits, the rest must be content with the Canton Fair.

Aside from the inevitable lament of buyers that prices should be lower, there is a fairly consistent litany of difficulties encountered by American businessmen in buying from China.

Large U.S. manufacturing or retail firms have found the Chinese unwilling to manufacture or pack under private American labels. These firms have sought, unsuccessfully so far, to persuade the Chinese that brand identification in the United States is so strong, that canned Maling Peaches, White Elephant flashlight batteries, Temple of Heaven sweaters, Pearl River shirts, or Aeroplane tennis rackets will never capture a meaningful segment of the American market unless they are improved and then sold, for example, under the names Del Monte, Eveready, Jantzen, Arrow, or Spalding. Firms such as these (and these are hypothetical examples) argue that consumers do not appear at the counter and ask for Chinese products, much less for a Chinese brand name. Instead, they have explained to the Chinese, American consumers want the assurance of safety, quality, and reliability afforded by a well-known brand name. "You will succeed in the American market," the Chinese are told, in effect, "because we have invested hundreds of thousands of dollars to develop consumer confidence in products bearing our name, and the origin of the product becomes immaterial." Such companies have offered to perform exhaustive testing of Chinese products, turn over know-how and specifications, and supply technicians to assist in production. They also are prepared to guarantee sourcing of the end-product from Chinese plants in substantial quantities over long-term agreements. To all of this, the Chinese have demurred. They maintain that the matter can be discussed, but the lack of positive response has already discouraged a number of firms. The Chinese have, however, come part way. They have agreed in certain cases to affix special labels, alongside their own, stating that a given product was made in China "exclusively for" a certain American firm.

Some of the U.S. firms interested in having the Chinese manufacture to private specifications and labels have gone to considerable time and expense to convince the Chinese of the good commercial sense of such a course. Since the Chinese show little inclination to market their own goods aggressively in a free market, and since they do express interest in boosting sales to the United States, why have they not acquiesced to these American proposals? Only the Chinese really know the answer, but some deductions are possible. First, they have not had to make such broad adaptations for any other foreign market, and they are selling to other nonsocialist states in Western Europe, for example, with but minor adjustments. Many believe, too, that Chinese supplies of foodstuffs, textiles, and light manufactures available for export are simply too small to justify gearing up for the American market, at least for now. This is particularly true as the Chinese have had to apportion export goods among a rapidly growing number of traders, not only from the United States, but from the several other countries which, over the last 3 or 4 years, have expanded diplomatic and trade ties with Peking.

While any country's production units would be strained to meet such rising foreign demand, the stress on China is especially acute, since a large percentage of manufacturing is done in factories which are small, scattered, and ill-equipped, and thus slow to respond and adapt to qualitative and quantitative change urged by new foreign customers.

Also, there may be residual suspicion—understandable in light of the predatory and deceptive trade practices of the West in Old China—that trade names the Chinese consider sound and internationally known will be deliberately and forever cut off from the most lucrative potential overseas market, the United States, if they accede to using U.S. tradenames and trademarks. Pride, too, is involved. China is unwilling to become a production appendage for foreign enterprise. A related practical problem may be that of satisfying the revolutionary committees which run a given factory that abandonment of Chinese labels, styles and so forth to meet foreign requests are worthy ideas.

There is truth, though, in the representations made by U.S. firms who press for private labels to this extent: the Chinese must either themselves overcome a disinclination to sell aggressively into the American market, agree to private labels, or be content with a very minimum market share for the foreseeable future.

Unready for aggressive marketing, if not philosophically averse to it, the Chinese must thus rely upon the initiative and resources of U.S. importers to bring their products before the American consumer. Here again, the Chinese confront a dilemma. For illustrative purposes, consider Mou Tai Chiew, a unique hard liquor introduced to Americans in part through its use in toasts Nixon and Chou En-lai offered each other at the Peking's Great Hall of the People in 1972. It is a Chinese product whose quality, price, and novelty make it potentially attractive in the United States. It can only be successful, however, to the extent its existence is made known to the American consumer. Development of a distribution system and necessary advertising requires time and money. The prospect for future sales does not by itself make it worthwhile for an importer to undertake introduction of this product, however; he may be willing to invest heavily in the promotion of the beverage only if he is assured that he will be the sole individual buying it from China. Before he expends the time and money required to capture a respectable portion of the market, he will want assurance that the Chinese will not sell the same item to one or more of his competitors allowing them, in effect, to capitalize on his marketing efforts and gain a free ride into the market. The importer will want, in other words, an exclusive arrangement for that product, protecting his investment over a defined geographic area for a specified period of time. Some cases have been reported that the Chinese have granted such "exclusives" to importers of more esoteric commodities, in the bristles and essential oils areas, for example, but no instances are known in which such exclusive arrangements have been reached with Americans for over-the-counter retail items. (The only exceptions here have been certain shoes and articles of clothing which the Chinese have made, on an exclusive basis, according to specifications furnished by certain importers.)

Federal regulations have already been mentioned as posing problems for the Chinese. Red meats cannot be sold into the United States unless and until the Chinese packing plants are open to inspection by the U.S. Department of Agriculture. Herbal-based medicines, however much the Chinese believe them efficacious, cannot be sold in the United States without exhaustive analysis by the Food and Drug Administration, nor may certain canned fruits and vegetables be admitted without proper factory registration and ingredients labeling. The Federal Trade Commission will not pass a number of Chinese labels which are prima facie misleading, though perhaps unintentionally so. Toys painted with lead-based paint are inadmissable, as are certain stuffed toys. Fabrics must not be flammable. Fireworks must meet a host of standards.

Where foodstuff exports are concerned, the Chinese will not issue guarantees that their product will meet FDA standards and inspections, although most other foreign suppliers do so routinely. The importer's risk, therefore, is larger with China than with other suppliers, and he must cover himself with "rejection insurance."

The Chinese have, at best, groped their way toward understanding of and compliance with some of these regulations. U.S. suppliers employ squads of attorneys and in-house technical experts to help them thread their way through the Code of Federal Regulations. So do most foreign suppliers. The Chinese, on the other hand, have relied for such guidance almost entirely on informal chats with importers at the Canton Fair and on assembled documents, statutes and regulations, mailed by such importers, always in English and usually without particularized analysis, to the FTC's in Peking. The Chinese have not yet sought the disinterested professional advice required to guide them through the tangle of Federal law. To proceed at a faster pace, the FTC's must either engage professional counselors in the United States, train their own experts in American law and trade practice, or unhappily learn the truth of the American adage that information you get for nothing is usually worth about what you pay for it.

Pricing has been another occasionally troublesome feature of the United States-China trade. The Chinese cannot be blamed if they thought it fair and reasonable to sell a given product at the same price to each American buyer at the Fair. Traders and commission agents, as opposed to retailers buying for their own account, have objected, however, and thus puzzled the Chinese. Their objection is that the procedure is not only unfair but contrary to accepted international practice. The problem here stems from the fact that if the Chinese sell a carpet to Retailer Smith for $100, he may be able to offer it for sale at $200. But the same carpet bought for $100 by Trader Jones must pass through a longer distribution chain before arriving at the retail level, and thus must, perhaps, be offered at not lower than $250 in the same community as Retailer Smith's store. Traders in Jones' position have argued that, as specialists in a given product, their capacity for larger volume purchases, and, consequently, greater public exposure to Chinese goods, warrants a discount. Without it, they say, the Chinese in effect deprive themselves of broader markets, for how long can a carpet be sold at $250 when some stores are advertising the same one at $200? This proposition is usually accompanied by the plea that in large orders, a "quantity discount" is warranted; that the per unit price for 1,000 carpets should be lower than that for 100 carpets. The Chinese have been very slow to accept the notion of quantity discounts, holding that economies of scale really do not occur in socialist production and, anyway, that the 1,000th carpet is not of lower value than the 100th carpet. This whole problem is further exacerbated when traders seeking quantity discounts argue that the occasional large order by a retailer, even if larger than that of a trader, should be denied the quantity discount so that the trader is protected against the kind of price-cutting possible in a single-tier pricing system.

This pricing problem is far from theoretical. American retailers and traders have nowhere in the world come to more ferocious disagreement among themselves than in China. After all, in nonsocialist countries production is so pluralistic that retailers and traders can readily make separate deals with different manufacturers. Each may also source his needs from the same supplier, but differing terms can be negotiated by each of them since the system more readily admits of flexibility. Socialist countries other than China have not matched Peking's pull on importers, nor are they significant suppliers of consumer goods to the United States. Thus it is in Canton that, to their undoubted distress, the Chinese strive to accommodate the antithetical wishes of their American customers, and try to do so in a State-controlled system where consistency, if not rigidity, is a quality more respected than rejected.

To their credit, the Chinese have shown interest and resourcefulness in working on this problem. It should be an easy one for them to conceptualize since they do maintain different prices for the same goods along geopolitical lines: Third World Friends pay less than American Friends for the same item, for example. One obvious solution to the puzzle is simply to sell different—even if only marginally different—goods to retailers than to traders. Then there is no suggestion of preferential or "two-tier" price treatment, but only "different prices for different goods."

Chinese awareness of international commercial practice is also evident in payment of commissions to buying agents. Some U.S. principals might be surprised to learn, in fact, that the commission they pay to their purchasing agent at Canton may be supplemented by a commission paid to him by the Chinese. These commissions range from 1 to 5 percent. If payment for the goods is made by the principal in a letter of credit to the agent or broker who, in turn, pays the Chinese then the agent or broker simply deducts his commission from the first letter of credit and pays the balance over to the Chinese. If the arrangement is for direct payment by the principal to the Chinese, then the Chinese by prior arrangement with the broker or agent may simply rebate his commission to an agreed-upon bank. This practice of rewarding business-getters is the only one which might be said to illustrate entreprenurial tendencies on the part of the Chinese in the export of goods. That there is no intention to deceive the ultimate purchaser may be evident from a case in which the Chinese consented to a commission to an agent who happened to be the spouse of the purchaser, and to agree to do so even though both were physically present at the Fair together, and together were involved in negotiating the purchase agreement.

Where goods must be brought by sea over a long distance, as in the case of imports from China, importers naturally wonder how well goods are likely to be packed and whether or not they will be shipped on time. On these matters, it is impossible to generalize. Some importers could be cited to prove that goods always arrive in perfect order and on time, and others to show that shipments usually arrive late and in pieces. On the whole, however, American importers have found goods to be well packed and shipped in accordance with the contract.

In those instances where goods arrive at variance with the contract, and it has happened, sticky problems do arise. China's practice is that inspection is final in China, and thus the burden of showing nonconformity with the contract rests at least initially with the importer. The Chinese have a deserved reputation for reasonableness in composing disputes short of arbitration, much less litigation. If settlement of differences cannot be achieved by cables or use of the mails, it is the Chinese habit to pursue the matter in friendly fashion over green tea. This practice has the appeal of sweet reasonableness until one recognizes that the tea is poured in China; claimants under purchase contracts with the Chinese must therefore invest the time, effort, and expense in a trek to Peking or to the Canton Fair for dispute settlement discussions. While standard Chinese export contracts do usually provide for arbitration in the event that "friendly discussion on the principle of seeking truth from fact" is unavailing, no case in known in which such formal arbitration with an American firm has occurred. Ingenuity in composing disagreements, though, such as discounts on future orders, cash refunds, rights to product exclusivity, substituted goods, and the like, has kept most of China's customers coming back.

Another example of problems arising out of the relative unfamiliarity of one side with the business practices of the other occurs where testing standards are concerned. This is well illustrated in the area of textiles, one of China's traditional exports and one which holds good promise of success in the United States. Among the prime requirements of the American textile buyer is that fabric or apparel must be subject to minimum shrinkage. Buyers of Chinese textiles were, at first, reassured to discover that the China National Textile Corp. was willing to guarantee shrinkage of less than a specified minimum percentage in most cases. Only after samples were tested in U.S. laboratories (or, in more unfortunate instances by retail customers) was it discovered that the degree of shrinkage was often greater than that specified. This occurred usually not because the Chinese intentionally misled buyers, but instead because garments here, but not in China, are ordinarily washed with detergents in hot water in automatic washing machines. The testing standards for shrinkage, in other words, are substantially different in the United States and China. While this problem was first identified in the early days of United States-Sino trade, it remains among those which are yet to be satisfactorily resolved.

V. Problems Exporting to China

A British firm in the 19th century is said to have shipped on speculation to China a very large quantity of sterling silver eating utensils. The firm lost a substantial amount of money, because in a flush of enthusiasm over the realization that the Middle Kingdom's 400 million people had to eat, it overlooked the fact that they ate with chopsticks. This may be an apocryphal tale, but it surely has a timeless moral for Western businessmen where trade with China is concerned: exporters must know the market potential for their goods and not simply conclude that large numbers of people plus a vast land area adds up to a ready market for nearly everything.

Visions of skyrocketing sales dance in the heads of international sales vice presidents even today, whether they are marketing diaper-pins for 20 million new births annually or calculating the various needs of a nation of 800 million potential autoists.

While it has not proven to be the ultimate market that many foreign businessmen have dreamed about, China is not a market mirage, either. U.S. sales to China, near absolute zero in 1971, jumped to $689 million in 1973 and to over $800 million in 1974.

The bulk of America's trade with China so far has been in agricultural commodities. In 1973 and 1974, between 80 and 85 percent of all U.S. exports to the People's Republic comprised agriculture goods, principally wheat, corn, raw cotton, and soybean oil, though a sag in 1975 agricultural sales is a good reminder that we are only a residual supplier of such commodities to the Chinese.

Besides agriculture items, the United States has major contracts to supply China aircraft, ammonia plants, blast-hold drills, mining trucks, medical and scientific apparatus and oilfield equipment.

Our export trade has not been limited to sales and purchases of products, but has included licensing technology to China in connection with sales of plants, either directly or indirectly. The $200 million sale of eight ammonia plants to the People's Republic of China by M. W. Kellogg was one of the largest single export sales by a United States firm in 1973.

These transactions may be only a start. Two countries as different as the United States and China, isolated from one another for more than two decades, have a great deal of learning to do about each other. And it has become clear to U.S. companies that exporting to the People's Republic of China differs markedly from doing business with other socialist nations.

Unlike East European nations or the Soviet Union, China permits no direct or indirect investments, and no joint ventures with foreign firms. Also, unlike East Europe and the Soviet Union, China publishes no details of its Five-Year Plan, its national accounts, or even its foreign trade, except in passing and sometimes confusing references, as noted earlier.

Establishing and Maintaining Contact

For U.S. exporters, trade with China is, for the most part, begun by writing to the appropriate Chinese Foreign Trade Corporation and sending descriptive company and product data. It is carried on from there by visits to Peking, by invitation only, and by cable and further correspondence. Companies interested in making sales to China are now using sophisticated techniques to promote their sales, including translation of booklets, films, and other material describing their products into modern, simplified Chinese. Our firms are discovering that trying to sell to China demands a thorough, long-term approach, and at least the amount of planning required for any other major foreign market.

For all but the few firms which have products of such renowned, unique, and unquestioned quality, utility, and indispensability that the Chinese probably know all about them, approaching the China market takes initiative, careful research, a large amount of patience, and unflagging persistence. It has already been mentioned that the U.S. exporter will need first to identify the FTC which handles his product line, and then he must try to determine whether or not that FTC has an interest in discussing possible purchase of his product.

Experience over the last 3 years has proven that there is really no alternative for the basic first step of preparing a written proposal for review by the Chinese and sending it to the relevant FTC in Peking. Some proposals have been more elaborately done than others. At a minimum, though, the company will want to introduce itself and its products, highlight the products available for sale to China with stress on the technology and performance involved, offer to the Chinese some mutually beneficial relationship, and seek an early meeting to talk business. Such proposals, in the opinion of many, are likely to be reviewed more readily, and even perhaps more favorably considered, if they are prepared in the Chinese language as well as in English. In any event, it is essential that multiple copies, as many as 10 or 20. be sent to the FTC. This is particularly true for the more diversified companies whose product variety may span a large number of departments within an FTC.

Once a company has invested the time and effort required to produce an introductory proposal for the Chinese, it is naturally hopeful for a prompt response. In most cases, responses have been anything but immediate. One American firm, distressed over the passage of months without a response from the FTC in Peking, became very troubled indeed at a rumor that the FTC in question had a policy of destroying its files at the end of every year to make room for the following years' papers. The firm reportedly cabled the U.S. Liaison Office in Peking imploring someone to visit the FTC to try to verify the rumor. Replies by return mail, even interim replies, are not to be expected from the

FTC's. After all, the FTC only acts as an agent for end-users. The FTC buys nothing for its own account. It must give the U.S. firm's proposal some preliminary analysis simply in order to know which end-users to involve before making broader distribution to permit, probably by end-users and technicians, a more thorough assessment of the submission.

It would be a substantially easier matter than in fact it is if the Chinese published or in some other easily ascertainable fashion made known a "shopping list" of foreign products, processes, or plant in which it had an interest. Assumptions can be made, of course, by persons who regularly follow China's trade and economic planning but, for a given firm's purposes, the guesswork can only be removed to its satisfaction if the Chinese are meticulously advised of that company's products and given a chance to respond positively or negatively to that company.

While U.S. sales to China are by no means unsatisfactory, a look at the volume and range of exports from Western Europe and Japan will be enough to show that in transportation, materials handling, telecommunications, data processing, machine tools, and equipment for the medical, construction, petroleum, and extractive industries, areas in which we are the leaders, the United States is lagging behind its potential. Since this may be partly explained by the fact that the United States and China remain for the moment becalmed in a less favorable diplomatic relationship, some U.S. firms with branches or affiliates in countries on better political terms with China have used them to good advantage in gaining access to Chinese diplomatic and commercial posts abroad, engaging Chinese commercial visitors to foreign countries for plant visits to subsidiaries, obtaining invitations for senior foreign-based executives to carry a sales package to China, and even arranging for display of their products to trade exhibitions organized by other countries in China.

Beginning as early as the 1971 announcements that Henry Kissinger had made a secret visit to Peking and that President Nixon intended to pay a call on the Chinese, there began an emergence of a plethora of "experts" eager for sizable up-front fees in exchange for commercial assistance to U.S. firms, and possessed, so they said, of unequalled personal contacts with persons calling the shots in China. This minor scourge, visited especially upon many of the larger U.S. firms in the earlier days of resumed United States-Sino trade, is finally on the wane.

Today, most successful U.S. firms have made their own direct approaches to the Chinese, perfecting and sustaining their efforts, in many cases, with consultative assistance without the firm of persons genuinely knowledgeable about China and the product who spend a major share of their time monitoring the company's Peking effort.

U.S. firms have sometimes found it useful to augment their direct approaches to the FTC's with collateral efforts directed at the Commercial Staff of the Liaison Office of the People's Republic of China in Washington, D.C., and in a few instances to the Bank of China branches in Singapore, Hong Kong, or London, or the China Resources Co. in Hong Kong. Finally, practical assistance has been available from the U.S. Departments of State and Commerce, the Commercial Sections of the American Consulate in Hong Kong and the U.S.

Liaison Office in Peking, and from the privately organized, nonprofit National Council for United States-China Trade in Washington, D.C. All of these latter institutions have been able to provide substantial assistance to interested companies uncertain about how to proceed toward the China market.

How China Shops for Foreign Goods and Know-How

If executives of a large American company took the trouble to formulate a 5-year plan of plant expansion, very likely they would widely publicize their capital equipment and other needs to suppliers and invite competitive bids. This would not only help assure them the lowest price but, as well, could turn up in bid submissions new information useful in the development plan.

It is one of the curious things about China that, having expended the effort to map out detailed trade and economic plans, these are kept secret. Moreover, even the annual plans of the FTC's involving the acquisition of plant and equipment are kept under wraps, and revealed piecemeal only as word trickles out of China that a certain company has had representatives in Peking for discussions. Limited manpower resources at the proposal review and negotiation levels appear to have contributed to the fact that FTC's which have made significant purchases have done so from abroad without the benefit of competitive bids. Instead, the Chinese seem to single out just a few of the leading firms in a given field, invite preliminary proposals, and, once having digested and compared the first set of submissions, zero in on only one firm for negotiations in depth. While it may be that sifting through early proposals is enough to isolate the most promising suppliers, it has been a regular lament of many U.S. exporters that better and more frequent access to the FTC's and a clearer idea of the particular interest and need would enable them to offer far more informative proposals and even lower prices than those which, owing to uncertainty about the buyer's need, they must build into less sharply focused proposals.

As in the case of selling her goods abroad, China is what might be termed a "passive" buyer. In the nearly 3 years since the Shanghai Communique, the Chinese have sent not a single commercial purchasing mission to the United States. With only one exception, the only Chinese "business" visitors have come in connection with training or familiarization under the contracts already signed with U.S. firms. The sole exception was a gas turbine "study group" from the China National Technical Import Corp. in January 1975. No contracts were signed during their visit. Thus, in the Middle Kingdom tradition, sellers must either themselves or through sales literature trek to China. Since an American President, the Secretary of State and a dozen Congressmen appear to have fallen into line on this timeless practice of journeying to China without yet having Chinese counterparts come here, businessmen should not be surprised that they, too, must carry the initiative in this fashion. It is this feature of Sino-American relations which suggests that, in trade at least, a single step may begin with a journey of 10,000 miles. It is true that the Chinese have sent what might be termed commercial surveying missions to West Europe and Japan. But the give-and-take of final negotiation almost invariably takes place in China.

From the Chinese point of view, one very satisfactory method for commencing the introduction of products from abroad is to invite foreign countries, at their own expense, to mount trade exhibitions in China.

Foreign exhibitions in China, organized by the China Council for the Promotion of International Trade, are an especially carefully monitored gauge of China's shopping interests. This is so in part because the Chinese themselves play an important part in selecting the products to be displayed and the firms to participate. Since 1971, there have been 38 such exhibits. Last year, for example, 52 Japanese concerns displayed about $5.3 million worth of sophisticated scientific and electronic equipment, including measuring, testing, analyzing, and recording instruments as well as numerical control systems, in Peking. The Japanese exhibits alone were visited by an estimated 105,000 Chinese, most of whom were specialists, and almost all the exhibits entered for sale were sold. Last October, France held a special exhibition in Peking devoted solely to measuring and scientific instruments, and the United Kingdom's Sino-British Trade Council arranged for a display of instruments in Shanghai April 1975.

The last major British experience in exhibiting in China occurred between March 26 and April 7, 1973 in Peking. Chinese attendance was a reported 200,000 and some $20 million worth of business is said to have been generated by the event.

All told, some 350 exhibitors participated. Exhibitors show their products not only from display stands and Chinese-language catalogs, but through a massive 300-plus page color catalog, fully translated into Chinese, which is issued quarterly by the Sino-British Trade Council. A very important part of this exhibit, and all such events, are the technical "exchanges" in which foreign experts give detailed technical presentations to Chinese engineers, scientists and end-users. More than 300 such lectures were given at the British Exhibition alone.

Italy had a large industrial exhibition in Peking during October 10–22, 1973, which was planned jointly by the Italian Institute for Foreign Trade, the Italian Ministry of Foreign Trade, the Chinese Ministry of Foreign Trade, and the China Council for the Promotion of International Trade. Like the British Industrial Exhibition, the products displayed covered a broad spectrum, from farm machinery to shipping.

From May 22 through June 7, 1974, the French mounted a major industrial, scientific, and technical exhibition in which nearly 350 companies participated. U.S. firms currently troubled by U.S. export control laws and regulations may be interested to learn that Aerospatiale's Division of Space and Ballistic Systems distributed fascinating full-color Chinese language literature describing the "Ariane," a multistage satellite-launcing rocket system. There were no reports of this system being sold, but the Chinese did buy measuring recorders, oscillographic instruments, ultraviolet recorders, spectrum analyzers, radiation detectors, neutron generators, oceanographic instruments, seismology equipment, cardiac defibrillators, intravenous filtration systems, and a range of intensive care units.

An earlier French exhibit, in which 29 firms participated, and composed solely of measuring and scientific instruments, was held at

Peking between October 9–19, 1973, and reportedly drew 20,000 visitors.

Just prior to the 1974 French exhibition, the Austrians held in Peking, between March 29 and April 4, the largest industrial exhibition that country ever held anywhere abroad. Among sales off the stands was a variety of scientific and measuring instruments, and medical equipment.

Between August 28 and September 9, 1974, Sweden held a combination "Biomedical Symposium and Exhibition" in China. This event featured pharmaceuticals and surgical tools as well as various diagnostic, therapeutic treatment, and laboratory equipment. Only eight firms participated in the exhibition, which, as its name suggests, combined in-depth technical presentations as well as product exhibits.

In other such events, Japan drew 100,000 Chinese visitors to an electronic and medical equipment show in Peking over 15 days between June 19 and July 3, 1973. Canada's Department of Trade, Industry, and Commerce sponsored an exhibit of electronic and scientific equipment from 36 countries in Shanghai between April 16–26, 1974; and 10 Danish firms showed electronic and medical instruments in a two-city (Peking and Shanghai) exhibit during August and September this year.

In the balance of 1975, the Chinese will host a number of major exhibitions. The British machine tool and scientific instruments show in Shanghai in the spring was cosponsored, among others, by the U.K.'s Scientific Instrument Manufacturers Association, and the Sino-British Trade Council.

Hungary, Argentina, and Japan all plan industrial exhibitions during 1975, but the largest such event of the year will certainly be a 2-week West German exhibit in Peking in September. It will cover 22,000 square meters of floor space, more than a third larger than the 1973 British Exhibition, which drew 200,000 visitors. It is interesting to bear in mind that the Chinese have asked the Germans to emphasize information dissemination aspects of the event.

While there has been no U.S. exhibition in China to date, some two dozen American firms, using foreign subsidiaries, have managed to display products in exhibits arranged in China by other countries, most recently in April, 1975, at the Belgian exhibit in Peking and the British exhibit in Shanghai.

In foreign capitals of industrialized countries with which Peking has diplomatic relations, the commercial sections of China's Embassies are generally organized in part in such a way that each FTC is represented by a person from that corporation. This arrangement permits experienced trade representatives not only to monitor but to become involved in commerce within their area of specialization. In some cases, such representatives are able to negotiate initial contracts on behalf of the FTC. This higher degree of commercial activity has not been possible in the United States, where the individuals composing the Chinese mission in Washington are limited in number. Nevertheless, the commercial staff of the Chinese Liaison Office in this country grew from two people in the summer of 1973 to more than a dozen by early 1975. Owing to a vast workload, Chinese commercial officers in Washington have only recently been able to travel outside of the city for visits to American trade shows, factories, and other points of commercial interest. In the meantime, however, they have been active as hosts for visiting business executives who call on the Liaison Office to leave literature and seek guidance on how best to proceed in mounting a sales effort to China. Once again, however, business discussions are invariably confined to the premises of the Liaison Office. Only in exceptionally rare cases have the Chinese visited the office of a firm's Washington representative, or even the neutral ground of a restaurant, to discuss a U.S. firm's interest in selling to China. Indeed, on very few occasions have the Chinese ventured out for visits of any kind, and these have been more social than business events.

China's Autarky and the U.S. Exporter

Business observers seeking clues to China's interest in plant and equipment from abroad are perhaps best advised to monitor foreign press accounts of deals actually concluded and negotiations actually begun rather than to try to fathom occasional press and broadcast pronouncements emanating from China.

Peking's interest in and need for advanced goods and techniques from abroad is undeniable. But so are the evident pressures from those Chinese, who for reasons of politics, ideology, or economic priorities, oppose such transactions as violative of the objective of "self-reliance." Recurring Chinese rhetoric, in fact, seems to strain to satisfy all sides of the continuing domestic debate over to what extent China should purchase abroad.

People's Daily, for example, has editorialized that:

> [W]e rely on our own hands to equip ourselves technically. The introduction of some essential new equipment and techniques is also for implementing the principle of making foreign things serve China and linking study with original creation so as to promote better self-reliance and accelerate the building of socialism.

The same newspaper, China's most important, recently reminded the Chinese people that:

> The erroneous notion of blind faith in the "advanced" technology of foreign countries still exists among some of the comrades * * * they see only the foreign countries, and seek only to import things * * * if they are permitted to have their way, they would take the evil road of revisionism * * * (but) in emphasizing adhering to the policy of maintaining independence and keeping the initiative in our own hands, and relying on our own efforts, we do not mean discriminating against learning from foreign countries * * * [we should] absorb whatever experience is useful to us * * * the introduction of a bit of foreign technology is permissible.

Still more recently, the influential Shanghai theoretical monthly Hsuehshi Yu Pipan ("Study and Self-Criticism") exoriated some Chinese for "worshipping things foreign"—those "who think the moon is rounder abroad." The journal directed its attack specifically at "certain servile lackeys of imperialism" working to "hawk the ideology that Chinese industry is incapable of developing without technical aid from abroad." It asked: "Did not China launch atomic bombs and artificial satellites in the sky, one after another, depending on our own abilities?"

On this same subject, Chou En-lai in his speech to the 1975 National People's Congress quoted Chairman Mao: "Rely mainly on our own efforts while making external assistance subsidiary * * *."

Historically, of course, the importation of foreign things has often led to vexing problems for China. The introduction of foreign ways and foreign goods in the 19th century was followed by systematic political exploitation and economic bullying. It proved impossible for China to have the benefits of foreign commerce without companion difficulties.

The most notable 20th century reminder to the Chinese that intolerable foreign interference can accompany the introduction of things from abroad occurred in the early 1960's. Reflecting a variety of disputes between the two countries, the Soviet Union abruptly withdrew its specialists, who took with them blueprints, plans, specifications, and every other tangible shred of technology they could deny the Chinese. The result was to leave the Chinese unable even to complete plants under construction, some of which they had no choice but to destroy. It is little wonder, then, that those charged with industrial development will seek in contracts with foreign firms to squeeze out every drop of disclosable technology. Nor is it surprising that there is a shrill chorus of criticism by those who fear that China may become too infatuated with and dependent upon foreign products and know-how.

The U.S. trade embargo of the fifties and sixties, as well as the Soviet's massive pullout of 1960, make understandable the fact that self-reliance, "walking on two legs," has become a major Maoist tenet. The import of advanced technology, know-how, capital goods, and plant remains essential, however, to China's industrialization. Herein lies the rub. China, quite naturally, would rather run on two legs to industrial modernity than walk. "More, Better, Faster, and More Economical" is a common slogan. The problem is where to draw the line. When and how often should the Chinese rely on what they consider to be the crutch of imported technology to advance their economic development?

One of the few certainties about the anti-Lin, anti-Confucius campaign has been its antiforeign technology component, and the alarm of the Chinese left at what it perceives as a dangerous increase in foreign dependency is part of the record.

Despite this dialog, however, China's high technology and capital goods purchases continue. The policy of selective absorption of foreign technology does not conflict with the guiding principle of self-reliance. Today's major purchases are of a type which can enable the Chinese eventually to increase agricultural and industrial production thereby cutting down imports and expanding exports.

Licensing U.S. Technology to China

Most foreign countries offer the American exporter a commercial environment hospitable to direct and indirect investment in a variety of forms. The most populous nation on earth does not.

In China it is impossible for foreign firms to lease a local office or hire a single local employee, much less to form a local partnership or corporation or establish a local plant. It is not possible to buy any local real or intangible property. It is not possible to make a capital investment of even 1 cent in any local enterprise, or to form a joint enterprise with any local entity. It is not even possible to travel to China to discuss the sale of products or technology without a firm prior invitation in writing.

It has been said that licensing is the "third best" alternative to doing business abroad, when neither exports nor direct investments appear practical. It ought to be, and is, of substantial interest to U.S. companies, that licensing appears to be a promising means to do business with China. Without it, many firms would be foreclosed from the market entirely.

For the Chinese, too, licensing U.S. technology has definite appeal. China is a country which, in a sense, could move from an agrarian to a technological society without encountering an industrial revolution along the way. And by what more efficient way than through licensing? Through licensing the Chinese can economize in domestic research and development costs, accelerate development, and even build needed depth and breadth into the current range of export products. And, unlike contracts for capital goods, licensing agreements are not ordinarily the subject of escalator clauses.

As in all technology transfers, the licensor to China must be conscious that today's licensee may well be tomorrow's competitor. The transfer of production secrets almost certainly dooms export of the product itself. Disclosure of patents and know-how, though restricted by all reasonable means, can never be fully protected from potential abuse.

Yet in transactions with China as elsewhere, licensing does help a company to recapture research and development costs, to enter a new or untried foreign market, and to do this generally without commitment of large amounts of capital. At a time when most raw materials and finished goods are in acutely short supply, and inflation is a scourge everywhere, it may be that United States-China licenses offer good opportunities to both sides of the transaction.

At this early stage of our bilateral commercial relations, however, it remains to be seen how amenable the Chinese will be to ordinary license practices. For example, licensing foreign patents and know-how will in some respects clash with restrictive notions of Chinese autarky. Secrecy provisions, though agreeable in principle to the Chinese, may prove difficult to monitor. How agreeable will the Chinese be to provisions often included to compel return of all blueprints, drawings, specifications, reproductions, and similar material in the event the licensing agreement goes sour? Can the Chinese be expected to require a licensee's employees to sign licensor-drafted nondisclosure agreements? Are such agreements needed, or enforceable, in China? Without a Chinese patent law, how is patent protection obtained? Without meaningful access to local courts, how may know-how be protected? What happens if the Chinese Government makes it impossible for the licensee to perform on his contract? What are the licensor's remedies should the licensee breach his agreement? What, if any, unusual provisions should be included in license agreements with the Chinese? Currency for payments? Penalty charges? Choice of law? Technical services or personnel training? Warranties? Term? Force majeure? Improvements? Taxes?

Although these questions have not been thoroughly explored in less than 3 years of United States-China trade, several U.S. firms have demonstrated the reality of this particular opportunity by concluding license transactions with the Chinese.

VI. Pending Legal Issues

An old Chinese proverb says it is better to die of vexation than to get involved in a lawsuit. It is a statement which well reflects the misgivings the Chinese historically have had about formal legal resolution of commercial disagreements. "To enter a court of law," says another adage, "is to enter a tiger's mouth." Lawyers in old China were almost entirely occupied with the criminal law, and, as in other Asian societies, theirs was not an altogether savory reputation for ethics or compassion. Consequently, there are today no lawyers as such to be found in China, nor is there what could be called a body of commercial law, nor are commercial disputes often submitted to formal tribunals for resolution. The Chinese perhaps have a greater faith than we do in the reasonableness and rationality of man.

In view of all this, Americans, perhaps the most litigious business people in the world, have expected legal complexities and misunderstandings to bedevil United States-Sino-trade. While such fears have proven largely unfounded, some legal problems do exist.

Dispute Settlement and Arbitration

Chinese import and export form contracts, though short, simple, and straightforward, often but not always have a clause which anticipates the possibility of disputes arising under the agreement. Such clauses simply say that disputes arising between the contracting parties shall be settled through negotiation, and that in case no settlement can be reached, the case under dispute may then be referred to arbitration. Variations on such clauses add that the parties should attempt to settle disagreements "through friendly discussion on the principle of seeking truth from fact."

Among the simplest arbitration clauses found in a standard Chinese contract provides that "should there be any disputes between the contracting parties, they shall be settled through negotiation. In case no settlement can be reached, the case under dispute may then be referred to arbitration." In this particular case, the form agreement is that used by one of the FTC's in export transactions, and it is evident that a dissatisfied buyer's rights and remedies are not very well spelled out in such a clause.

In standard form contracts where China is the purchaser, the arbitration clause is sometimes more detailed. Such a contract, in use by the China National Machinery Import and Export Corp., provides that:

> All disputes in connection with this Contract or the execution thereof shall be settled friendly through negotiations. In case no settlement can be reached, the case may then be submitted for arbitration to the Arbitration Committee of the China Council for the Promotion of International Trade in accordance with the Provisional Rules of Procedures promulgated by said Arbitration Committee. The Arbitration shall take place in Peking and the decision of the Arbitration Committee shall be final and binding upon both parties; neither party shall seek recourse to a law court or other authorities to appeal for revision of the decision. Arbitration fee shall be borne by the losing party. Or the Arbitration may be settled in the third country mutually agreed upon by both parties.

Tradition and contemporary practice in China's foreign trade is such that there is no public record at all of decisions rendered in disputes referred even to the relative informality of arbitration, and precious few cases go to arbitration at all. This is so despite the fact that the Chinese have evolved a mechanism of their own for arbitration of disputes.

In 1954, Peking established the Foreign Trade Arbitration Commission of the China Council for the Promotion of International Trade, and then a Maritime Arbitration Commission, also under the CCPIT, in 1958. A body of rules has been promulgated for each Commission, and parties seeking arbitration under the rules are required to select from the Commission's 15 to 21 members one arbitrator or, if they wish, one arbitrator apiece who together agree upon a third to form a panel of three. A list of members of the panel is not available from either Commission. Peking is the site for arbitration set forth in most form contracts. The language of the proceedings is, under the rules, to be Chinese, and proceedings must be in writing, but a party may be represented by an attorney or agent who is not a citizen of China, and arrangements for translation and interpretation may be made. Decisions of the arbitrator or panel are not appealable, and enforcement of an award, if the parties cannot themselves achieve it, may be ordered and executed by the People's Court.

American firms beginning in 1972 expressed unease over a dispute resolution system which seemed to compel "friendly discussion" in China on Chinese terms, and which offered in the event of deadlock only the more uncertain prospect of arbitration in Peking before a panel of Chinese arbitrators following Chinese rules and proceeding in the Chinese language. The arbitration clauses themselves do not specify how a foreign claimant may initiate the arbitration process, and some cases are known where the Chinese side, preferring to continue "friendly discussions," have declined a claimant's request for arbitration.

Perhaps in response to these misgivings, adjustments have begun to appear in China's form import and export contracts. One, for example, provides explicitly that if no settlement can be reached the dispute may be referred to the Foreign Trade Arbitration Commission "or a competent Arbitration Committee in a third country approved by the two Contractual Parties for arbitration" and, further, that arbitration fees "are to be borne by the losing party."

U.S. exporters, in particular, have been concerned that dispute resolution mechanisms open to them were inadequate, and they have been satisfied in some recent major contracts to secure Chinese agreement to arbitration in such third countries as Sweden, Switzerland, and Canada. The fact that no cases in recent years have gone to arbitration may be reassuring to U.S. firms. But this fact must also be viewed as raising the question of whether the Chinese will ever really go to arbitration, notwithstanding such a contract clause. Skeptical corporate counsel have concluded that the Chinese have "reluctantly" agreed on the matter of third country arbitration only to insist on "reciprocal" concession from the American side of far greater commercial consequence in the overall transaction. Also, some firms have been so delighted at the prospect of arbitration in a third country and not in Peking that they have not sought to press the Chinese for a more elaborate clause spelling out the rules to govern the form, commencement, and legal procedure of the arbitration, the applicable law and when necessary, enforcement of any award. Failure to give attention to these essential points may, for practical purposes, nullify the clause.

An interesting indicator of China's preference for nonarbitrated, informal resolution of commercial disputes is a report given in January 1975, by CCPIT legal officials to two representatives of the American Arbitration Association in Peking, that in 1974 only one dispute was settled through arbitration and award, 12 were resolved through mediation, and more than 100 cases were composed through "friendly negotiation."

A recent U.S. Supreme Court decision has a potentially important bearing on contracts between American firms and China's Foreign Trade Corporations.

In *Scherk* v. *Alberto Culver*, decided June 17, 1974, the Supreme Court had before it the question of enforceability of an arbitration clause in a contract between a U.S. firm and a German citizen.

The clause provided, in part, that "any controversy or claim [that] shall arise out of this agreement or the breach thereof" would be referred to arbitration before the International Chamber of Commerce in Paris, France, and that Illinois law would govern the agreement and its interpretation and performance. The Alberto-Culver Co. sought to avoid arbitration in Paris that have exclusive recourse to U.S. courts, notwithstanding the clause. The Court rejected Alberto-Culver's plea and, instead held that "the Agreement of the parties in this case to arbitrate any dispute arising out of their international commercial transaction is to be respected and enforced by the Federal courts in accord with the explicit provisions of the Arbitration Act."

The Arbitration Act of 1925, 9 United States Code § 1, provides that an arbitration agreement of the type involved in the *Alberto-Culver* case "shall be valid, inevocable, and enforceable, save upon such grounds as exist at law or in equity for the revocation of any contract." In the majority opinion, Mr. Justice Stewart said the act, "reversing centuries of judicial hostility to arbitration agreements, was designed to allow parties to avoid the costliness and delays of litigation." The arbitration clauses of international agreements, in particular, were held deserving of enforcement:

> A contractual provision specifying in advance the forum in which disputes shall be litigated and the law to be applied is, therefore, an almost indispensible precondition to achievement of the orderliness and predictability essential to any international business transaction. Furthermore, such a provision obviates the danger that a dispute under the agreement might be submitted to a forum hostile to the interests of one of the parties or unfamiliar with the problem area involved.

Citing with approval the Court's decision in an earlier case, *The Breman* v. *Zapata Offshore Co.*, 407 U.S. 1, Justice Stewart concluded that to invalidate the arbitration agreement would reflect "a parochial concept that all disputes must be resolved under our laws and in our courts * * *. We cannot have trade and commerce in world markets and international waters exclusively on our terms, governed by our laws, and resolved in our courts."

In reaching its decision, the Court had before it an amicus curiae brief filed by the American Arbitration Association (AAA) which urged "the fullest recognition possible to arbitral forums bargained for by the parties to international agreements."

Not only is international arbitration desirable, and in some cases a superior method for dispute settlement between parties of different countries, argued the AAA in its brief but effect should be given where possible to U.S. policy, reflected in American adoption of Foreign Arbitral Awards. The United States acceded to the Convention in 1970 (3 U.S.T. 2517), T.I.A.S. No 6997), and Congress gave it practical effect by amendment to the Arbitration Act (9 U.S. Code §§ 201 ff).

In a final footnote to the opinion in the *Alberto-Culver* case, the Court recalled that the goal of the Convention, to which this country subscribed:

> Was to encourage the recognition and enforcement of commercial arbitration agreements in international contracts and to unify the standards by which agreements to arbitrate are observed and arbitral awards are enforced in the signatory countries.

The decision ought to be read and carefully weighed by counsel to U.S. firms doing business with China. It is a reminder that persuading the Chinese to accede to arbitration at a site outside of China is not alone enough, but that careful attention should be given to the procedural and substantive law to govern any eventual arbitration in a third Country. The *Alberto-Culver* case is also notice to the Chinese that American courts are now all but certain to enforce international arbitration agreements wherever possible to do so.

China is not a signatory to the United National Convention on the Recognition and Enforcement of Foreign Arbitral Awards, and the prospect of Chinese enforcement of an arbitral award in American courts may be considered dim because of reluctance to resort to a lawsuit. For the time being, then, U.S. firms may have to be content with faith in China's demonstrated ingenuity in composing disagreements fairly and in timely fashion through friendly discussion.

Disputes which invariably pose thorny and unavoidable confrontations are those arising out of maritime collisions and other marine accidents where ships and cargoes are involved. In recognition of this, the CCPIT promulgated in January 1975, "Provisional Rules for General Average Adjustment" and, at the same time, established a Department for Average Adjustment. Presumably China's form contracts will be amended, where and as necessary, to incorporate these new rules by reference.

Protection of Industrial Property Rights

Marxist hostility to private property and monopoly control of socially useful inventions are reflected in China's scant protection of what the nonsocialist world refers to as industrial or intellectual property.

China is completely without such. All inventions and technology are considered to be the property of the State. An awareness that some incentive can foster invention is, however, evident from the fact that in 1963 a system was established whereby inventors were made eligible for an official certificate of recognition and a cash award. Nevertheless, the Chinese neither recognize foreign patent rights as such, nor provide any statutory procedure for their protection. China's position on this issue is that they are willing to provide protection for foreign inventions by contract on a transaction-by-transaction basis. For example, the Chinese have agreed that they will limit their use of potential technology to the single installation for which it has been made available. A number of U.S. companies have expressed concern about the lack of established patent procedures as well as the refusal of the Chinese to adhere to multilateral conventions concerning patent rights, a concern which has not been diminished with the discovery in two instances that the Chinese have copied and exhibited internationally without permission or acknowledgment certain agricultural chemicals developed by U.S. firms. Such discoveries were made because the Chinese offered these chemicals under the U.S. brand name thinking, apparently, that the names were generic.

China lacks internal copyright laws and it has not agreed to adhere to any of the multilateral copyright conventions or any national legislation abroad. The lack of copyright protection has not been of serious concern to U.S. firms, since the Chinese voluntarily refrain from commercially exploiting foreign literature domestically. The potential for abuse exists nevertheless.

A procedure, administered by the China Conncil for the Promotion of International Trade, is available for the registration of foreign trademarks in China. A law providing "Measures for the Control of Trade Marks" was issued in China in 1963. However, the Chinese require a bilateral agreement between themselves and the country of the potential registrant before they will permit such trademark registration. The United Kingdom, Sweden, Switzerland, Denmark, Finland, and Italy are among the countries which have concluded such bilateral agreements. There is no United States-China agreement on the subject.

Some U.S. firms are known to be studying the possibility of registering their trademarks in China through overseas subsidiaries in countries which do have trademark agreements with China.

Registration of a foreign trademark in China is granted to the first applicant on an exclusive basis for 10 years and renewable for further 10-year periods. Registration, based on 78 classes of goods, may not be in a foreign language for goods intended for use in China. Registered foreign-owned trademarks may be assigned to other foreigners.

Since the Chinese import very few consumer goods, there appears to be little need at the moment for American firms to register their trademarks. The only foreign consumer goods seen in China for sale to the general public have been Swiss and Japanese watches and Cuban cigars. Not registrable are words or markings similar to China's national flag or other official emblems of other countries, similar to marking of the Red Cross, and those which have an ill effect politically. There are no opposition provisions, nor time limit for governmental processing of applications. A trademark registration may be canceled where the quality of the product does not meet governmental requirements, reflecting a policy paralleling trademark law in the United States: Consumer protection. A registration may also be canceled where it is altered without governmental authority, where a registration has not been used for 1 full year and no permission for such nonuse has been granted and where the Government approves a third party application for cancellation.

The lack of a United States-Sino trademark agreement at present seems to pose more difficulties for the Chinese than for firms in this country. U.S. trademark law protects the first user of the mark, and bilateral national agreements are, from the U.S. point of view, not necessary to enable a foreign national, individual, or corporation, to register a trademark here. Thus, the Chinese factory producing "Lion Brand" footballs sold here is as free to register that mark in the United States as any American manufacturer is free to register its marks.

Mutuality as a principle in China's foreign trade, and the fact that the United States and China do not yet accord each other formal diplomatic recognition, may be two important reasons why the Chinese have not yet taken steps under U.S. law to protect at least some of their more internationally known trademarks here, as they have in other places. Without taking such steps, however, the Chinese risk the possibility that another "first user"—an importer, distributor, retailer, or commission agent, for example—might himself successfully make application for trademark registration. The danger to China, should such registration be granted, is that the independent owner of the Chinese trademark may then be able to prevent further importation and sale of the product bearing that mark except on his own terms. In effect, such a registrant may wrest what amounts to an exclusive right to sell that product in the United States; this has happened to other foreign firms. The Chinese have expressed some awareness of this problem, but as yet they have authorized no applications on their behalf. Such applications, if accompanied by the customary trademark search, would also reveal whether or not any Chinese marks currently in use infringe upon existing U.S. marks.

While the People's Republic of China is a member of no international patent, trademark, or copyright convention, the Chinese did send, in observer status, the chief of the Legal Department of the CCPIT to a recent meeting of the World Intellectual Property Organization in Geneva.

Outstanding U.S. Claims and Frozen Chinese Assets

As noted earlier, the United States at the time of the Korean War, seized approximately $80 million worth of assets of the People's Republic of China, the majority of which were held in U.S. banks. The Chinese retaliated with the confiscation of private U.S. property in China. The Foreign Claims Settlement Commission has, under the Chinese Claims Act of 1966, validated private U.S. claims totaling approximately $196 million. Interest is not being paid or accrued on the frozen Chinese assets in this country; interest is accruing at the rate of 6 percent per annum on the claims certified by the Foreign Claims Settlement Commission.

In February 1973, it was announced by the United States that an agreement "in principle" had been arrived at with China for the settlement of this issue. As of this time, however, the Chinese side has not signified its agreement to any settlement of the matter. "Technical difficulties" have been ascribed as the reason for the delay.

Without a settlement, validated claims held by U.S. claimants could, at least theoretically, form the basis for attachment of private Chinese property within the jurisdiction of American courts. Chinese Government property, such as diplomatic buildings and furnishings, are protected against such settlement under the doctrine of limited sovereign immunity. But private property (more difficult to define where, as in the case of China, there ought never to be "privately owned" property as we ordinarily understand the term) would be subject to seizure in satisfaction of claims.

The problem poses enough of a peril that the Chinese Archeological Exhibition which opened in December 1974, at the National Gallery of Art in Washington, D.C. was accorded exemption from attachment by Suitors Act of Congress. Also, the Chinese, in making purchases of equipment and agricultural commodities in this country, do not take title to the goods until delivery is made in China. For the same reason, China has not risked any of its own flag cargo vessels in U.S. ports; those vessels which have called here have been under charter and have flown third country flags. It has already been noted that the claims/assets difficulty has prevented direct U.S. banking relationships with China. It is unlikely that the Chinese will be able to mount any kind of a trade exposition in this country without either a resolution of the problem or some other device to take the goods to be displayed clearly out of the category of attachable property, nor for the same reason can Chinese commercial aircraft be expected to put down at U.S. airports.

The Trade Act of 1974, embodies a section potentially troublesome where settlement of the claims issue is concerned. Section 408 requires a claims settlement, previously negotiated with Czechoslovakia by the State Department, to be renegotiated and submitted for congressional review on the grounds that the settlement reached was unfair to U.S. claimants. China is not mentioned in the section, but any eventual settlement negotiated with Peking is at least potentially liable to a similar congressional "veto."

Contracts: Law and Practice

The Chinese have a saying: "Honor the contract." It is a rule to which the Chinese attach considerable importance, and therefore the party who does business with the Chinese is well advised to pay close attention to what the contract says.

A Chinese export contract, often simply called a "sales confirmation," is a simple, standard form. Usually it is printed in both Chinese and English. While the forms do vary from FTC to FTC and, as necessary, within each FTC to accommodate differences in commodities, they ordinarily provide blank spaces for recitation of no more than these elements: date, parties, description, quantity, and price of the article, loading port, destination, time of shipment, packing and shipping mark, insurance, terms of payment, and "remarks." Often, but not always, the reverse side of the contract forms list certain conditions, relating to documentation instructions, finality of inspection; shipping advices, letter of credit procedures, force majeure, arbitration, and claims. In some respects, Chinese form contracts resemble purchase orders with which U.S. firms are familiar.

Buyers who seek deletion or modification of material terms which appear on the printed contract or who seek to add terms and conditions, encounter resistance from the Chinese. Yet it is important for such buyers to press for inclusion of terms they deem genuinely essential to a complete expression of the understanding of the parties. The Chinese do ordinarily live up to their own injunction to "honor the contract" but oral understandings or conditions, in China as here, are not regarded as forming part of the contract.

Certain features of Chinese form contracts have proved troublesome to American businessmen. Force majeure clauses, for example, have been found not to cover strikes or "Acts of God," as far as the Chinese are concerned. They will not accept as an excuse for late delivery or failure of performance the fact of striking workers, whom they ideologically *a priori* assume to be resisting unjustifiable exploitation, nor do they concede existence of God. Nor do the Chinese ordinarily forgive late or nonperformance due to the intervention of foreign government authorities, the theory being that no foreign government is a party to the contract and thus cannot alter its terms. The Chinese still regard as an impermissible breach of contract the failure of certain American firms to deliver steel scrap, rejecting as legally insufficient the excuse that the U.S. Government made the export of such steel scrap illegal. The force majeure debate has been a frustrating one for U.S. firms, since the Chinese neither want to enumerate the many instances which the concept might embrace, nor do they always accept the kind of "catch-all" clause (such as "all other unforeseen circumstances of each and every kind beyond the control of the parties") which are frequently found in Western agreements.

Some standard form Chinese agreements provide simply that "sellers shall not be held responsible for late delivery or nondelivery of the goods due to Force Majeure." Such a clause may be found in both import and export form Chinese contracts, although an obvious conflict may later arise over what is embraced by the term "force majeure" and what is not.

In certain of their export contracts, the Chinese appear more concerned about safeguarding the seller who meets with problems. The China National Cereals, Oils and Foodstuffs Import and Export Corp., for example, uses a clause in its printed sales contracts which provides that "should the Sellers fail to deliver the contracted goods or effect the shipment in time by reason of war, flood, fire, storm, heavy snow, or any other causes beyond their control, the time of shipment might be duly extended, or alternatively a part or whole of the Contract might be canceled without any liability attached to the Sellers, but the Sellers have to furnish the buyers with a certificate attesting such event or events."

Inspection of goods in trade, whether they are exported from China or imported to China, will under Chinese contracts be final in China alone. This is a notable instance in which the principle "equity and mutual benefit" seems as a matter of practice to be ignored. Perishable and breakable goods, arriving decayed or in pieces at a U.S. port, may be the subject of a claim, but it will be a claim in the face of a final certificate of inspection issued by the Chinese authorities that the goods were in proper condition at the time of shipment from China. The FTC's do not reciprocate this requirement in their own purchasing: goods purchased by the Chinese must meet final inspection tests at the port of discharge in China, or a claim will lie. The only known departure from this latter requirement is a reported willingness on the part of the Chinese to accept as final a certificate from U.S. agricultural inspection authorities that a given wheat shipment is free of a certain type of infestation. This procedure responds to a specific problem, however, and shipments as a whole, whether agricultural or nonagricultural, remain subject to final inspection in China.

Late delivery or delayed payment by a foreign firm makes that firm subject to penalties, and the Chinese, as sellers, have successfully assessed such penalties as a charge of 1 percent of the contract price per month on late payments even where the contract does not specify that penalties are to be imposed.

A typical clause governing penalties to be assessed for late delivery of goods to China is the following, excerpted from a preprinted purchase agreement used by the China National Machinery Import and Export Corp.:

> Should the Sellers fail to make delivery on time as stipulated in the Contract, with exception of Force Majeure causes * * * the Buyers shall agree to postpone the delivery on condition that the Sellers agree to pay a penalty which shall be deducted by the paying bank from the payment under negotiation. The penalty, however, shall not exceed 5 percent of the total value of the goods involved in the late delivery. The rate of penalty is charged at 0.5 percent for every 7 days, odd days less than 7 days should be counted as 7 days. In case the Sellers fail to make delivery 10 weeks later than the time of shipment stipulated in the Contract, the Buyers shall have the right to cancel the contract and the Sellers, in spite of the cancellation, shall still pay the aforesaid penalty to the Buyers without delay.

In complex sales to China, U.S. firms have not been required to accept standard penalty clauses, but instead have been able to negotiate their own. Typically, the Chinese negotiators give oral assurances that they never intend to assess penalties as long as the U.S. supplier is making a good faith effort to perform, no substantial delays occur, and the Chinese side is kept fully apprised of any changes in delivery dates. It is, nonetheless, wise for American firms in this connection to bear in mind another standard clause commonly found in Chinese contracts, to wit:

> Any alterations and additions to this Contract shall be valid only if made out in writing and duly signed by both parties.

Chinese export contracts usually call for shipment to occur within a specified period of time, sometimes over as much as 3 months, rather than on a particular date. When the goods are ready for shipment, the FTC concerned notifies the buyer of that fact and requests payment through a confirmed and irrevocable letter of credit. Not until the Chinese have payment in hand will goods be shipped. They buy on generally the same basis. Normally the Chinese sell on a C. & F. or CIF basis; they usually buy f.o.b. the U.S. port, thus using insofar as possible their own insurance and cargo transport

Naturally, it is not possible in large and complex transactions, particularly where the Chinese may be acquiring plant, processes, or complicated equipment or systems, for the entire agreement to be expressed in a preprinted short form document. Plans, specifications, drawings, warranties, involved delivery and payment terms, training arrangements, spare parts schedules, inspection procedures, know-how transfer and a host of other terms and conditions have, in China as elsewhere, swollen agreements into weighty volumes. The contract for the sale of 10 Boeing 707 aircraft to China, for example, is well over 100 pages. Not surprisingly, as a result, the Chinese legal experts have shown interest in reviewing copies of typical commercial agreements, or agreement checklists, for large and involved transactions.

An important element of disagreement and concern in recent contract negotiations between U.S. sellers and the Chinese involves the use of an escalator clause on price. Thus far, the Chinese have successfully resisted any language which makes the price of goods at the time of delivery uncertain. Consequently, American firms had to inflate somewhat the fixed price finally written into the agreement. The Chinese recognize this, but evidently prefer the certainty of a firm price over the possibility—perhaps remote these days—that an inflation-index price formula might, in the end, afford them a lower price.

Federal and State Regulation

The formidable array of State and Federal laws and regulations governing goods in commerce in the United States has understandably proved confusing to the Chinese. Compliance even by U.S. firms with consumer protection statutes, as mentioned earlier, has become very involved, and China can be forgiven if, after more than two decades of freedom from such complexities, some of these and similar laws were at first viewed as intended to frustrate China's entry into the U.S. market.

The Chinese have yet to arrive at a systematic method for grappling these requirements. To date, they have done little more than ask importers to provide them with copies of the relevant statutes, or excerpts from Federal regulations on the very elaborate requirements of the Food and Drug Administration, the Federal Trade Commission, the Department of Customs, and the Bureau of Alcohol, Tobacco and Firearms of the Department of the Treasury. Without concomitant and particularized analysis, as U.S. firms and experienced foreign suppliers know, the language of the Code of Federal Regulations, the United States Code and various Department and Agency guidelines and forms afford marginal guidance at best to those seeking to understand and comply with the legislative will. Chairman Mao's instruction that "all genuine knowledge originates in direct experience" ought eventually to be an incentive to the FTC's to meet with American experts in the various regulatory fields, including the relevant U.S. agencies themselves, rather than rely upon incompletely informed businessmen for guidance.

Export-Import Bank Credits, Private Financing, and the Johnson Debt Default Act

The Chinese People's Republic has consistently expressed abhorrence to long-term debt. This extended, until relatively recently, even to medium-term financing. There is, in China, an ideological unwillingness to accept debt financing which is grounded as much on an awareness of the stranglehold Western finance gained over China in the 100 years before 1949 as it is on Lenin's warnings about the pernicious proclivities of the banking establishment. Debt service of foreign loans alone in old China required a level of taxation which, in no small part, helped enslave the world's largest national population. Payment under large contracts with American firms, for Boeing Aircraft, M. W. Kellogg ammonia plants, Bucyrus-Erie blast-hole drills and shovels, and shipments of agricultural commodities, has been on a cash on the barrelhead basis. The Chinese have not so much as hinted that they are interested in loans from the U.S. Export-

Import Bank or any other U.S. or foreign bank. It is true that some medium-term financing with interest payments included but not denominated as such (the Chinese use the term "deferred payment" not "credit") has been a part of some sales to China. But it is illustrative of the Chinese commitment to a conservative payments policy that they sought deferred shipments, and thus deferred payments, of some agricultural and industrial shipments in late 1974 and early 1975, with the attendant probable dislocations in domestic planning or production, rather than accept the credit which would surely have been available to them abroad. More recently, there have been reports that the Bank of China has sought funds in the Eurodollar market, but it is too early to tell if this foreshadows major Chinese borrowing abroad.

Under present law, loans or guarantees of the Eximbank would not be available in connection with sales to the People's Republic of China anyway without a determination by the President, applicable to loans to all socialist countries, that such credit would be in the national interest. Moreover, in the case of China, there must be some resolution of the problem currently reflected in the Bank's books, namely that China remains obligated for the repayment of some $20 million in loans made prior to 1947. While such loans were made to the Kuomintang regime of Chiang Kai-shek, the Bank in its regular reports to Congress has testified that the People's Republic of China succeeded to assets purchased with the proceeds of such loans, and thus stands obligated for repayment.

Since such obligations, and perhaps other U.S. Government claims on China, may be said to place Peking in default of obligations to the United States, there are activated the provisions of the Johnson Debt Default Act, which prohibits under such circumstances certain private U.S. individuals, partnerships, corporations, and associations from certain types of financial transactions with China or its state instrumentalities. Under an advisory opinion of the Attorney General, issued in 1967, it is clear that the act does not proscribe export financing by American firms or banking institutions so long as the terms of the transactions are grounded on bona fide business considerations and do not involve a public distribution of securities. While the Attorney General's opinion does clarify somewhat the circumstances under which credit arrangements may be made with the Chinese, the act has suffused such possible transactions in such legal uncertainty that the administration has wisely but so far unsuccessfully sought its repeal.

VII. Facilitating Commercial Relations

In the relatively short time since 1972's Shanghai Communique, there have come into existence in the United States several practical aids to American firms fully the equal of those to be found in any other country. This has responded to a genuine need, since interest in trade with China sprung immediately from a host of firms, large and small, import and export, and has continued to grow. These reliable sources of advice and assistance have also tended to reduce the mischief done, intentially or not, 2 or 3 years ago when it seemed that every person of Chinese heritage, every ex-GI who had served in the China-Burma-India campaigns, and every recent student of Chinese history or literature was offering himself to U.S. firms as consultant or commission agent. The principal sources of information and assistance on trade with China are:

Bureau of East-West Trade, U.S. Department of Commerce

The People's Republic of China Affairs Division in the Office of East-West Trade Development of the Bureau of East-West Trade is staffed with specialists in most aspects of doing business with China. The Chinese linguists, economists, and commercial officers of the Division have been able to augment their familiarity with China with visits to the Chinese Export Commodities Fair, and with discussions with the Foreign Trade Corporations and U.S. commercial officers in Peking. The Division prepares "Doing Business With China," one of a series available from the Department of Commerce in the "Overseas Business Reports" series. This indispensable publication is supplemented from time to time by other literature from the Division.

Address: PRC Affairs Diviison, Bureau of East-West Trade, U.S. Department of Commerce, Washington, D.C. 20230. Telephone 202-967-2908.

Office of PRC Affairs, U.S. Department of State

Like its counterpart at the Commerce Department, the Office of People's Republic of China Affairs in the State Department is composed of career specialists on China and the Far East. A former Director of this office became the first Deputy Chief of the U.S. Liaison Office in Peking. The office has continued to be the unit principally involved in day-to-day liaison with the American mission in Peking, and its staff members, who travel to China with some frequency, have made themselves available to firms interested in the Department's views on trade and political developments in China.

Address: Office of PRC/M Affairs, U.S. Department of State, Washington, D.C. Telephone: 202-632-0670.

U.S. Liaison Office, Peking

Commercial officers of the U.S. Liaison Office in Peking have provided invaluable assistance not only to businessmen visiting Peking, but also to firms with specific questions posed by mail or cable. Much of their reporting on economic conditions and commercial opportunities in China is available from the China Affairs Office in the State Department.

Address: Commercial Section, U.S. Liaison Office, 17 Kuang Hua Lu, Peking, People's Republic of China. Telephone 522-033.

People's Republic of China Liaison Office

Many firms have found it useful to establish and maintain contact with commercial officials of the Chinese Liaison Office in Washington by apprising them of direct contacts initiated with the Foreign Trade Corporations in Peking and in seeking guidance on approaches to China. Though understaffed, given the high degree of interest in working with them, these commercial officers have shown a ready willingness to meet with U.S. businessmen.

Address: Commercial Section, Liaison Office of the People's Republic of China, 2300 Connecticut Avenue NW., Washington, D.C. 20008.

National Council for United States-China Trade

Responding to a situation in which the lack of diplomatic relations left something of a vacuum in bilateral trade promotion and information efforts, the National Council for United States-China Trade was formed in May 1973. It is a private, nonprofit association of some 250 companies, large and small, interested in doing business with China. The Council publishes a valuable bimonthly magazine, *United States-China Business Review*, as well as a number of other studies on practical aspects of U.S. trade with China. Recognized as a counterpart organization by Peking's China Council for the Promotion of International Trade, and maintaining a close working relationship with the FTC's, the Canton Fair, and the Chinese officials in Washington, the Council is the focal point in the United States for reciprocal trade missions and exhibitions. An extensive translation, research, and business counseling service is available to its members.

Address: National Council for United States-China Trade, 1100 17th Street, NW., Washington, D.C. 20036. Telephone: 202–331–0290.

In addition to the foregoing, American businessmen have found useful assistance available from the Commercial Sections of the American Consulate in Hong Kong and the U.S. Embassy in Tokyo, as well as from the American Chambers of Commerce in Hong Kong and Tokyo.

VIII. Recommendations

One experienced China hand regularly advises newcomers to the trade that, in doing business with the Chinese, nothing is easy, and everything takes longer than it should. It is not always the fault of the Chinese, he explains, but largely the effects of a commercial hiatus of two decades. The accumulation of experience over the fullness of time should solve most of the problems currently vexing traders on both sides. In the meantime, however, progress in that direction can be expedited by the two sides at official and unofficial levels. Whether and to what extent the two governments do so will have an important bearing on the evolving political relationships between them.

Elements of a Sino-United States Trade Agreement

The prospect of a trade agreement between the United States and the People's Republic of China has, since the Shanghai Communique, offered the possibility of marked forward motion in the relations between the two countries. It assumes substantial importance for both sides in light of the passage of the Trade Act of 1974 in the closing days of the 93d Congress. Under the act, Public Law 93–618, signed by the President on January 3, 1975, the authority to lower tariffs on imports from China has shifted from Congress to the Executive. There are limitations on the authority of the President to grant most-favored-nation tariff treatment to China, to be sure, but the negotiating authority now is there, and there is no good reason not to proceed with all deliberate speed to trade negotiations with Peking.

The threshold question, of course, is whether or not the United States should contemplate a trade agreement with a country to which it has not yet accorded diplomatic recognition. Precedent for such an agreement under international law, if such were needed, lies in a trade agreement entered into between Great Britain and the Soviet Union in 1921, a step which preceded formal diplomatic relations. The same question may be raised in Peking, although the Chinese have previously concluded trade agreements in the absence of diplomatic ties. While the two sides will have to examine whether, on pragmatic grounds, a trade agreement should precede or follow the establishment of full diplomatic relations, trade negotiations toward such an agreement can certainly begin prior to fully normalized political relations.

Assuming a trade accord could be drawn which achieves gains for both sides in the commercial sphere, and one which at least offers no obstacle toward fully normalized State relations, it seems the sensible view that negotiations for a trade agreement should begin without delay, and that they should not await an exchange of ambassadors. Indeed, such an agreement could accelerate the move toward mutual recognition and, should recognition occur prior to or in the course of trade negotiations, obviously that poses no added difficulties.

In a strictly commercial context, there seem ample reasons to seek trade accord now. Both sides, for example, can benefit from the following possible elements of such an agreement:

AN AGREEMENT TO SETTLE EXISTING CLAIMS

As noted earlier there has been no perceptible movement on the $196 million in private U.S. claims for property taken by China, and some $80 million worth of claims by Peking for assets seized in this country at the time of the Korean War. There has been speculation that the Chinese are presently unwilling to implement a reported "agreement in principle" on this matter for unspecified domestic political reasons. A trade agreement would provide an overall framework for the resolution of outstanding matters such as this, perhaps providing the justification necessary for the Chinese to proceed on what appears to have become a wholly stalemated matter. Such a settlement would also compensate, at least in part, Americans who deserve some restitution for confiscation of private property. Agreements to settle claims of this sort are not uncommon in trade agreements. The Soviet Union agreed to settle $722 million in lend-lease obligations as part of the United States-U.S.S.R. trade agreement signed in October 1972. Resolution of this matter, as suggested earlier, would also break a logjam which presently prevents direct banking relationships, air routes, and maritime accords, and which exposes to attachment all non-diplomatically protected Chinese property coming within the jurisdiction of U.S. courts. Not to proceed on this particular matter has some important negative effects. Improvements in United States-China relations presently enjoy the support of the American public. It is rare to hear from the Congress or elsewhere any serious opposition to the rapprochement begun in 1972. History is replete, however, with lessons of how unexpectedly changes in public mood or snags in official policy can occur. The impact on the Trade Act of the question of Jewish emigration from the Soviet Union, which led ultimately to Soviet nullification of the 1972 trade agreement with the United States, is a striking example.

Negotiation of the United States-China claims matter in the context of a trade agreement which balances benefits to the two sides also offers less chance of exposing the eventual settlement to perils of the type encountered by the United States-Czech accord. Although the Chinese may justifiably wish some clear prior assurance from the U.S. side with respect to the acceptability of the Settlement to the Legislative Branch so that their pact is not, as the Czech one was, overturned by Congress.

More delicate politically than the matter of private claims are certain U.S. Government claims carried as delinquent against Peking. These arise out of loans, credit, and lend-lease to the Chiang Kai-shek regime prior to 1949. Included in such claims is an item carried by the Export-Import Bank as a receivable from "China (Mainland)" for loans to the Nationalists. Peking does not acknowledge such debts, and if pressed by the United States in trade negotiations, the subject could be expected to sink the discussions in a quagmire. For that reason, this matter should best be left to separate discussion. where more politically charged issues can be considered together.

MOST-FAVORED-NATION TARIFFS

Under the Trade Act of 1974, only through a trade agreement with the United States can China be accorded most-favored-nation tariff treatment by the Executive Branch. The possibility exists that Congress, notwithstanding the Trade Act, could enact a law unilaterally lowering tariffs for China, but such an eventuality is most unlikely. This subject, then, represents for both sides an important part of eventual trade discussions. The Chinese side might be expected to show indifference if not irritation over the fact that the matter arises at all in the context of trade negotiations. Afer all, the imposition of column II rates of duty on Chinese goods was a unilateral form of economic discrimination by the United States in the first place; why should the Chinese now be expected to deal for lower tariffs? In both the Shanghai Communique and subsequent joint statements, the two sides have pledged themselves to a dismantling of obstacles to trade, but there really is no question about the fact that current U.S. tariffs are a unilaterally maintained hindrance to trade even though the embargo erected by this country has for the most part been dismantled. While the Chinese must be conceded debate points on this score, the hard fact of the matter is that the Executive is not free to grant MFN status unconditionally, and the Congress simply will not stand for extension to the Chinese the privilege of exporting to the United States on a reduced tariff basis without some form of reciprocity. That reality is carefully and expressly engraved in title IV of the Trade Act. It is not enough that China would allow U.S. goods to enter her market at preferential duties, since the range of goods marketable in China's nonconsumer society is severely limited. In fact, no nonmarket economy can really grant foreign products the same market benefits as those enjoyed by her own.

The clause by which the two sides extend MFN treatment to each other should express the fact that such treatment will be unconditional and unrestricted, applying to all matters concerning customs duties, surtaxes, and subsidiary charges, as well as customs clearance formalities, regulations, and procedures. China has been willing, however, to reciprocal limitations on unconditional most-favored-nation treatment to special trade relationships the other party may have with neighboring countries, customs unions, or similar international pacts.

Conditions Precedent to MFN for China

The Trade Act also provides, at section 404 of title IV, that the President "may, by proclamation, extend nondiscriminatory treatment to the products of a foreign country which has entered into a bilateral commercial agreement referred to in section 405."

Section 405 provides, subject to certain conditions, that "the President may authorize the entry into force of bilateral commercial agreements providing nondiscriminatory treatment to products of countries heretofore denied such treatment"—language which is the authority for trade accords with Communist countries, including China.

It is not surprising that the Congress attached strict conditions to Presidential authority to proclaim lower duties on imports from Communist countries. Congress historically has jealously guarded its sole power, under article I, section 8 of the Constitution, to lay and collect taxes and duties and regulate commerce with foreign nations. The 93d Congress in title IV simply sought to afford the Executive enough flexibility to conduct foreign trade negotiations while, at the same time, to establish the limitations within which that flexibility may be exercised.

The limitations of section 405 provide that a bilateral commercial agreement with China must promote the purposes of the act, be in the national interest, and meet other very specifically enumerated conditions, as follows:

1. The agreement must be limited to an initial period of no more than 3 years, renewable for additional periods of up to 3 additional years, if:

   (*a*) A satisfactory balance of concessions in trade and services has been maintained, and

   (*b*) Actual or foreseeable reductions of U.S. tariff and nontariff barriers resulting from multinational negotiations are reciprocated by the other party;

2. The agreement is subject to termination or suspension for national security reasons;

3. The agreement must contain safeguard arrangements to protect domestic industries from threatened or actual injury or market disruption;

4. The agreement must protect property rights of U.S. nationals in patents and trademarks not less than the rights specified by the Paris convention for the Protection of Industrial Property (to which China is not a party);

5. The agreement must protect copyright interests of U.S. nationals not less than the rights specified in the Universal Copyright Convention (to which China is not a party);

6. The agreement must provide for protection of industrial rights and processes;

7. The agreement must provide arrangements for the settlement of commercial disputes;

8. The agreement must provide arrangements for trade promotion, such as for trade and commercial officers, participation of trade fairs and exhibits, trade missions, and for facilitation of entry, establishment, and travel of commercial representatives;

9. The agreement must provide for consultations and periodic review, as well as make provision for such other commercial arrangements as will promote the purposes of the act.

In addition to the foregoing, the President is precluded, by section 402 of the act, the "Jackson Amendment," from concluding a trade agreement with any country which he determines:

1. Denies its citizens the right or opportunity to emigrate;

2. Imposes more than a nominal tax on emigration or on the visa or other documents required for emigration, for any purpose or cause whatsoever; or

3. Imposes more than a nominal tax, levy, fine, fee, or other charge on any citizen as a consequence of the desire of such citizen to emigrate to the country of his choice.

No nonmarket economy country is eligible for MFN tariff treatment under a trade agreement with the United States unless the President certifies to Congress that the country in question is not in violation of the foregoing three conditions.

Under rather complex provisions of the statute, the President may waive these three requirements if he can assure Congress that such a waiver will (1) substantially promote the objectives of freedom of emigration, and (2) that he has received assurances that the emigration policies of the foreign country will lead substantially to the achievement of freedom of emigration.

The entire "freedom of emigration" section, while directed solely against the Soviet Union's policy of restricted Jewish emigration, by its terms also would apply to China. Secretary Kissinger acknowledged this in testimony before the Senate Finance Committee adding, however, that the provision would "present massive difficulties if we attempt to apply it to China."

The provision is ill-advised. Early confirmation of its mischief came swiftly, in the form of a repudiation by the Soviet Union of the entire October 1972, United States-U.S.S.R. trade agreement. It is hard to imagine China—or any country—permitting the kind of interference in domestic affairs which is represented by such a condition on normal bilateral trade relations. There is as yet, however, no indication that the Executive or the Congress is inclined to press hard for repeal of section 402, and, without repeal, any United States-Sino trade agreement could be undone by Congress on the ground that the Chinese violate one or more of the section's freedom of emigration conditions. It is also possible that the Chinese may be reluctant to start trade discussions with the United States as long as the freedom of emigation section remains in the statute. An approaching U.S. election year may not be the best time to seek repeal of the Jackson Amendment, yet the administration should at least send to Congress proposed remedial legislation.

MARKET DISRUPTION

The Trade Act's requirement of safeguards against dumping, market disruption, or other unfair practices as a condition precedent to the extension of most-favored-nation tariffs to nonmarket countries ought to give the Chinese little difficulty. China trades according to the principle of equality and mutual benefit. She really has no excessively favorable balance of trade with any country, nor do China's products, excepting the unusual situation of Hong Kong, heavily predominate in any foreign market. Where China enjoys most-favored-nation tariff access to Western markets, in Canada, for example, there has been no capture of a large part of any market, no instance of dumping nor any other unfair trade practice. There is some small evidence, in fact, that the Chinese do not for long allow their own base price advantages to exist: one American importer of an item which is dutiable at the same rate from column I and column II countries at first found a significant price advantage in the Chinese product. Recently, however, he reports that Peking has raised the price of that product to a point where it is no longer profitable to opt for the Chinese model. Many traders believe that with MFN treatment, the Chinese, in a quest for foreign exchange, will raise their prices to a point at which dumping would be improbable. Also, as the Chinese readily suggest to foreign visitors concerned on this score, China's own domestic consumption is so large that exportable surplus is not likely to be substantial in any category of manufactures. It is worth recalling that China, unlike Japan, is not by tradition or ideology an aggressively trading nation, and China's current exports to this country are at about the same level as those from tiny Nicaragua. Moreover, it may be more than a little unbecoming for the United States, which has reaped a surplus of more than $1.5 billion in trade with China in 3 short years, to quibble about a possible adverse impact of Chinese exports on this economy.

If there is an ominous aspect in the area of market disruption, it lies with an amendment to section 205 of the Antidumping Act of 1921 by the new Trade Act. This amendment codifies a questionable Treasury practice with respect to determining foreign market value of goods from state-controlled economies, for dumping purposes, in a manner which, potentially at least, could place a severe limitation on the ability of China to export manufactured goods to the United States. The amendment, at section 321, ch. 2, to title III of the Trade Act, authorizes the Secretary of the Treasury to find the foreign market value of the merchandise on the basis of normal costs, expenses, and profits as reflected by either (1) the prices at which such or similar merchandise produced in a non-state-controlled-economy country is sold either for consumption in the home market, or to other countries, or (2) on the basis of constructed value of such or similar merchandise in the non-state-controlled-economy country. The amendment would even permit a constructed value comparison with the sales price of merchandise produced in the United States in the absence of an adequate basis for comparison in other non-state-controlled economies. The effect of this new provision could be to deny U.S. market access to certain Chinese exports by, in effect, wiping out price advantages of products which become the subject of a dumping complaint.

DISPUTE SETTLEMENT MECHANISMS

As may be seen from the earlier discussion of this subject, a systematic method for resolving commercial disputes arising between the Chinese and American firms is for practical purposes nonexistent. While U.S. parties have been able to name certain cities other than Peking as a situs for arbitration proceedings, the very important question of the rules to govern such proceedings has not been addressed, much less resolved. The National Council for United States-China Trade, the China Law Panel of the American Society of International Law, and the American Arbitration Association are presently working together on this subject. Their work includes attention to the all-important questions of a model arbitration clause for contracts in United States-China trade, the matter of a panel of arbitrators acceptable to both sides, rules of procedure, award enforcement, and applicable substantive law. As matters stand, most contracts concluded between U.S. firms and a Chinese FTC which do provide for arbitration in a third country leave these questions open. These subjects have been discussed in Peking between attorneys representing the National Council, American Arbitration Association representatives, and officials of the Legal Department of the China Council for the Promotion of International Trade.

Some form of agreement by the two sides on these questions will not only lend an important element of certainty to commercial transactions, it will also minimize the likelihood of deadlocked business disagreements which, in the evolving United States-Sino-rapprochement, could have an unfortunate political impact. Since neither the Chinese nor American firms may wish in every case to be limited to dispute resolution through arbitration, provision ought to be made in any trade agreement making clear the fact that legal and natural persons have access to the domestic courts of the two countries, and that sovereign immunity from suit or execution of judgment with respect to commercial matters will not be invoked by either side. Such a provision is particularly important when, as with China, the State owns and controls the means of production and the instruments of foreign trade transactions.

Private talks with CCPIT legal officials indicate that Chinese interest in orderly, fair, and expeditious resolution of commercial disputes makes this element of a United States-China trade agreement uncontroversial.

PROTECTION OF CERTAIN PROPERTY RIGHTS

It has already been mentioned that China is without any law protecting foreign patents or copyrights, and that Peking's trademark law operates to permit registration of foreign marks only after conclusion of a formal bilateral trademark agreement. Thus, American patents are presently protectable only case-by-case in connection with contracts concluded with the Chinese. American authors and composers have no protection whatever against copying by the Chinese, who theoretically at least could produce books or records in Chinese or in English, for domestic use or export abroad, without permission and without compensation to copyright owners. At least some U.S. trademark owners are sufficiently concerned about losing marks to China that, as suggested earlier, they are seeking to register their trademarks in Peking through foreign subsidiaries in countries having a bilateral trademark agreement with Peking. But the matter is not as one-sided as the foregoing may suggest. China, too, has inventions, processes, copyrightable material, and valuable trademarks, and a trade agreement can do more than merely encourage protection of these property rights under U.S. law. It may also, by public notice of such rights, serve to broaden awareness of the American people to China's own achievements.

BILATERAL TRADE PROMOTION EVENTS AND FACILITIES

The occasionally fashionable slogan, "World peace through world trade," may claim more for international commerce than is justified by experience. But trade can and does play an important part in the web of relationships through which people come to understand each other better, and by which countries help meet each other's needs. Recognition of this byproduct of trade is acknowledged in a negative way each time countries sever trade ties in times of conflict. The U.S. embargo on trade with China is such an example. Countries hoping to achieve better bilateral ties, then, do well to look to commercial relationships for areas of cooperation.

At the present time, there exists a definite need for improved assistance to American businessmen engaged in doing business with China. Existing communications are slow. Travel to China cannot be undertaken without special invitation from the Chinese side, and even when that permission is given logistical arrangements are not always easily made. Once in Peking for discussions, or at the Chinese Export Commodities Fair, businessmen often find they are without the aids to trade and business upon which they have elsewhere come to depend. They may need access to a photocopier, telex, movie projector, et cetera, or the collateral equipment required when these items break or wear out unexpectedly. These matters may sound minor, but to businessmen 10,000 miles from the home office, negotiating major transactions, these everyday take-for-granted tools can be the *sine qua non* of successful business. The U.S. Liaison Office cannot, without distortion of its major purposes, undertake to offer these kinds of services to visiting businessmen on a major scale. Consequently, the United States should strive, in negotiations leading toward a trade pact, for Chinese agreement to the establishment of a trade center or similar facility which affords this support. The Chinese themselves would be perhaps the greatest beneficiaries, since they would have a place in addition to the official Liaison Offices to which to address, for transmission to the United States, questions and requests about U.S. firms or products of interest, prices, and other market conditions, and so forth. The United States should, in exchange, be prepared to offer the Chinese access to one or more reciprocal facilities in this country. The People's Republic presently lacks any outlet of its own, beyond the Liaison Office in Washington, to display goods or discuss trade matters.

Trade promotion worthy of the name cannot be confined to static offices or showrooms. To date, there have been far too few trade missions exchanged between the two countries. Only one visit, to Peking in November 1973, occurred in which a broadly representative group of American business executives, from the National Council for United States-China Trade, have visited Peking, at the invitation of the China Council for the Promotion of International Trade. The return Chinese delegation, invited in 1973, is expected in this country in September 1975. There has, of course, been some travel by individual representatives of American firms to the Canton Fair, and by Chinese technicians to United States plants in connection with existing contracts. Some Americans have been invited to Peking for informal talks with the FTC's, or the CCPIT. But these visits are rarely publicized, with the result that an unnecessary perpetuation of unfamiliarity and ignorance in one side about the other occurs. Visible and active efforts at commercial interchange should be fostered. Washington and Peking should agree to institute a regular exchange of commercial missions. The primary purposes of such exchanges would be the generation of two-way trade, but an important secondary objective is served as economic leaders from the two sides have more frequent opportunities to meet and exchange views. Still another purpose served is that of awakening the communities visited in the two countries to the reality of improved United States-Sino relations.

Another opportunity for trade promotion combined with a visible sign of improved relations is that of reciprocal trade exhibitions. While this subject has been discussed between the National Council and the CCPIT, no dates have yet been set. Announcement of such events, and the pledge of the two sides to work to insure their success, could form an important part of a bilateral trade agreement.

MARITIME AND AIR ACCORDS

Included in connection with a number of China's existing trade agreements are accords by which the two sides agree that the ships flying the flag of one party shall, in entering, berthing, and sailing from the ports of the other party, enjoy most-favored-nation treatment in all respects, and that neither party will act to restrict the liberty of ships from the other with respect to normal competition with third country vessels. Such provisions ought to pose no problem in any U.S.-Sino agreement. In fact, it becomes an important element as China builds her merchant fleet, and as expanding maritime trade increases the need for direct shipping between the two countries. The question of air routes is more complex. It is doubtful that a trade agreement can or should be the medium for determination of the details of scheduled air service between the two countries. A trade agreement could, however, acknowledge a mechanism for the settlement of such questions and commit the two sides to negotiate eventual agreement. Until scheduled air service can begin, permission at least in principle could be given in a trade treaty for unscheduled or charter air service. At present, only the unresolved problem of conflicting U.S. claims and Chinese assets keeps China's airliners from U.S. airports; there is no American restriction on such flights to or from China. Peking has not yet agreed, however, to permit charter carriers from the United States to land in China, except in connection with delivery of official visitors or carriage of goods intended for use at the U.S. Liaison Office.

TOURIST PROMOTION

Despite a sharp rise in the cost of international air travel, China remains a very substantial potential market for tourism from the United States. It is the last and most exotic of "undiscovered" lands. Thousands of eager travelers have written to Peking, to the Chinese Liaison Office in Washington, to airlines and to travel agents inquiring about opportunities to visit China. Peking has been most reluctant to admit tourists on a large scale, and has begun to open its doors to them only in the most gradual way. Despite the fact that an inflow of the tourist dollar represents hard currency earnings without significant capital investment, the Chinese still acknowledge their hotel, transport, and related facilities as inadequate by world standards. As conscientious hosts, they are unwilling to move before they are truly ready. China must also look upon the prospect of tourism as potentially disruptive to revolutionary values and order. A country with a xenophobic tradition, regimented and austere, can hardly greet with enthusiasm the prospect of free-spending and demanding, if not misbehaving, foreigners wandering around loose. Since the existing law governing movement of foreign nationals within China is extremely rigid, this is a potential handicap to development of tourism.

Placing the undeniable risks and problems alongside the unquestionable foreign exchange gains to the Chinese, it appears that a mutually determined effort to advance U.S. travel to China step-by-step could form a useful part of a bilateral trade agreement. The U.S. Government need not become involved in the arrangements for actual visits, but through cooperation with reputable professional travel agencies, trade promotion associations, ocean carriers, and airlines in the United States, Washington could help Peking's China International Travel Service, the official Chinese travel organization, build toward expanded visits by Americans. Public interest in travel to China needs to stimulus beyond some reliable and efficient means, presently unavailable, to learn about travel opportunities. The accord on tourism reached in October 1974, between the United States and the U.S.S.R., could provide a model clause for an agreement on this subject.

COMMERCIAL STUDIES PROGRAM

A major theme of the present study illustrates the gulf in understanding of commercial practices which exists between individuals on the two sides who are charged with actual business or trade promotion. What else could be expected when a two-decade separation is compounded by the sudden collision of nearly antithetical economic systems? The experience of actual business transactions, and the trade promotion mechanisms suggested here, will help bridge the knowledge gap. The great differences in economic outlook, however, should inspire a greater interest by each side in mutual study, and not permit isolation out of fear that exposure to the ideology of one side will fatally infect the other. Chairman Mao has urged the value of study by stating flatly that one who has not studied a subject has no right to speak about it. Within the four corners of a trade agreement, then, the two sides could agree to a reciprocal program of education of commercial specialists—in trade, banking, and law, for example—or more extended programs in the two countries than is possible in 3- to 4-week excursions. These programs, combining the admirable feature of China's own educational processes, a work-study experience, could be financed out of a fund made possible by the settlement of adverse claims, through matching funds appropriated in the two countries, or in cooperation with professional and academic institutions in the two countries.

UNITED STATES-CHINA COMMERCIAL COMMISSION

Upon his return from China in July 1972, the late Hale Boggs, then Majority Leader of the U.S. House of Representatives, proposed in a report to the Joint Economic Committee the creation of a joint United States-Sino Commercial Commission. "Until we have more normal State relations with China," he said, a "quasi-public body" could lay a basis for a variety of trade accords. The National Council of United States-China Trade is by nature equipped to negotiate some commercial steps beneficial to both sides Unlike the CCPIT, which has concluded some semiofficial trade agreements which bound the Chinese Government, the National Council as a private corporation has no corollary authority. In Peking's trade agreements with other countries, it has occasionally been decided to form mixed trade commissions to meet annually in the two countries to review trade matters of mutual interest. Particularly in the absence of diplomatic relations, such a commission could devote itself to a number of important subjects, and do so short of formal contact between the U.S. Department of Commerce and China's Ministry of Foreign Trade. A shared role for the National Council, U.S. Government officials and business leaders on this side, for example, and participation by the CCPIT, the FTC's and the Foreign Trade Ministry on the Chinese side, would blend public and private involvement. In addition to trade promotion activities, such a commission could be a useful forum for ongoing discussion of such trade issues as quotas, tariffs, nontariff barriers, commodities inspection by authorities on each side, international monetary and energy problems, and other subjects.

PAYMENTS ACCORD

Although technical arrangements are ordinarly left to separate instruments, China's trade agreements often address the subject of payments transactions between the central banks of the two countries. A United States-Sino trade agreement could contain a similar article, specifying among other things the acceptability of payments in U.S. dollars as well as in other mutually acceptable currencies.

LEGAL STATUS OF PRIVATE COMMERCIAL REPRESENTATIVES

The very strict restrictions in Chinese law over the entry, residence, and travel of foreign nationals in China, and the absence of any agreement to date on the rights and legal status of U.S. business visitors to China, suggest that a trade agreement could be the appropriate instrument for clarification of the status and treatment of private American commercial travelers to China. The two sides could further signify an interest in facilitating trade between them on a reciprocal basis, by simplifying, for commercial travelers, such matters as visa application, in-country travel, customs clearance, and security regulations over temporary residence.

Private Trade Accord

The two governments may, of course, fail to achieve any time soon the kind of diplomatic progress they may deem essential as a condition precedent to a government-to-government trade agreement. In such a case, each side ought to be looking to other means for insuring and demonstrating forward motion in their relations. One means of doing so is the encouragement of a private trade agreement, perhaps similar to those which preceded Sino-Japanese diplomatic relations. The CCPIT and the National Council for U.S.-China Trade are the most logical parties to such an agreement, which could address many of the elements otherwise appropriate in a government agreement, such as a bilateral program of exchanges, trade exhibits, and private trade promotion facilities in the two countries. An accord of this sort could even establish unofficial arrangements for the resolution of commercial disputes, means for the protection of intellectual and industrial property rights, mechanisms for the regular exchange of trade and business data, and channels for mutual assistance in achieving purchase and sales objectives of mutual interest.

Areas Which Merit Congressional Attention

All of the foregoing steps toward expanded bilateral trade can be accomplished in a United States-Sino trade agreement. Should negotiations falter, however, the Congress can itself achieve some forward movement in United States-China trade. The existence of authority in the President to extend most-favored-nation tariff benefits does not deprive the Congress from acting unilaterally to remove present tariff discriminations on imports from China. Should the Congress undertake consideration of such a measure, or pass it, however, the Chinese interest in negotiating other possible elements of a trade agreement might diminish. A middle ground would be for the Congress to vote the lower column I tariffs for China subject to and effective upon conclusion of a trade agreement with the United States satisfactory to the administration. This would have the salutory effect of acknowledging the unilateral and discriminatory nature of present U.S. duties, but at the same time withhold restoration of most-favored-nation treatment pending a sign that the two sides are achieving progress in bilateral trade facilitation. Alternatively, duties could be lowered selectively, on such items as silk goods, where China represents a unique source of supply essentially noncompetitive with U.S. firms. To be sure, the Executive Department may object to such a scenario on the ground that it curtails certain U.S. negotiating strategies, and the Chinese may view such action as amounting to a kind of blackmail to come to agreement on other trade issues, but this method of dealing with the question of MFN for China does offer one way to expedite what could otherwise involve interminable negotiations.

Congress should also exercise more of an oversight function on the administration of U.S. export controls. The Export Administration

Amendments of 1974 do not reach a number of the concerns expressed in congressional testimony of American firms. These include those related to maintenance of bothersome administrative requirements, such as that for end-use information on Government forms; the inordinate delay in processing of some export license applications; the apprehension that the administration sometimes turns a blind eye to less rigorous export licensing by other COCOM members; the generally accepted view that, notwithstanding administration protestations to the contrary, a "China differential" does exist precluding certain sales to China which are approvable to the Soviet Union and other Communist countries, and the belief by many high technology firms that existing criteria for export license decisions are substantially out of date.

Appropriate committees of the Congress should also examine the legality and practical effect of certain kinds of quantitative U.S. export controls. The adverse impact on United States-China trade of suddenly imposed limitations on soybean and steel scrap exports, for example, has understandably shaken the faith of the Chinese in the willingness or ability of American firms to abide by their contracts. This is not to suggest that the national security or welfare should be subordinated to the commercial interests of China's FTC's or U.S. exporters, but only that ill-considered and unnecessary Government actions can be an irritant which unduly jeopardizes a diplomatic relationship of overriding importance.

Finally, Congress ought to accomplish two other steps it should have taken, but didn't, in the Trade Act of 1974, to repeal the Johnson Debt Default Act and the continuing embargo on seven furs and skins from China.

IX. Summary and Prognosis

Through 1975 and beyond, there will continue to be substantial United States trade with China. Following total two-way United States-Sino trade in 1974 of $930 million, trade between the two countries will probably decline to about $550 million in 1975. The downtrend will be reflecting, primarily, a softening of Chinese demand for American agricultural commodities—principally wheat, corn, and cotton.

Despite this projected decline, however, there will be an overall increase in the proportion of U.S. exports of machinery, technology, and equipment sold to China.

Imports from China, presently running at about $12 million a month, will continue to increase, but slowly. Chief imports from China will continue to be such items as textile goods, tin and tin alloys, bristles, works of art, and so on. With the annual volume of imports running at close to the level of our imports from Nicaragua, protectionist elements in this country ought not to become aroused, although certain especially sensitive industries, such as textiles and footwear, can be expected to keep careful watch over import trends.

The imbalance in our trade with China, which has so far been heavily in the favor of the United States by 10 or 11 to 1, will be considerably reduced in 1975, perhaps to about 2 to 1. There will continue to be a rising level of U.S. businessmen visiting China. The Spring 1975

Canton Fair saw record numbers of Americans—well over 400—transact substantial business. The National Council for United States-China Trade has been given assurance by the China Council for the Promotion of International Trade that the first broadly representative trade mission from Peking will visit the United States in 1975.

American executives charged with developing the China market will need to keep their perspective. Occasional deals of major proportions by some firms are bound to spark the fires of euphoria in other companies. Political zigs and zags in both countries, on the other hand, will add elements of uncertainly if not discouragement. And what is bound in any event to be a gradual growth in trade will remain a stern test of entrepreneurial patience and perseverance.

The basic lesson, as in all enterprise, will be to try to learn what is true and relevant about China and to plan accordingly. China remains today, as it was two centuries ago, a self-contained and fundamentally agrarian peasant society. Some 80 percent of the people live in rural areas and are engaged in agriculture. The economic onslaught from the West in the 19th century, as much as Marxist-Leninist-Mao Tse-tung Thought, explains recurring apprehension among Chinese leaders about the motive of foreign enterprise. Caution and even skepticism about outside influence was reinforced in the decade following Liberation, when the Chinese learned that even a socialist brother and neighbor is capable of cynical economic manipulation.

Yet, attempts at wholly self-supported development following the rupture with the Soviet Union have shown severe limitations. The Chinese have proven almost miraculously able to develop agriculture at a pace sufficient to feed the world's largest population, but population increases will require still greater achievements in food production. Industrialization does not as easily lend itself to mass mobilization of labor. Industrial capacity is not only now inadequate, but plants are fast becoming obsolete. Coal and iron ore deposits cannot be efficiently extracted with existing equipment and methods. But improvements here, and in transportation, can permit accelerated steel production. Modernized machine tools are needed to build capital goods. Sophisticated equipment and know-how can enable rapid development of China's petroleum reserves. Needs are compelling for improved power generation, materials handling equipment, and communications. Computers, farm equipment, chemical processes, petroleum refining, synthetic fiber production, and plastics all represent not only the harbinger of an improved living standard and an enhanced capacity for exports but, perhaps most importantly, a more solid opportunity for self-sufficiency.

Herein, of course, lies the paradox. To sustain and build toward the modern industrialized state to which the Chinese pledged themselves in January 1975 at the Fourth National People's Congress does require acquisition of foreign goods and technologies. Purchase of needed imports in turn requires more than a little contact with the West. Not all such contact is likely to be palatable to a political leadership which is bound to fear that revolutionary values may wane in the process. The post-Mao, post-Chou period cannot be far away, and succeeding leadership is certain to be preoccupied with political consolidation, preserving revolutionary fervor, and maintaining the monumental accomplishments of the old leadership. This process can obviously sharply influence China's trade and development policies. But Peking's 1975 pledge to achieve "comprehensive modernization * * * before the end of the century" should be signal enough that the China's foreign trade ought to hold interest for American firms.

Appendix I

China's Foreign Trade Corporations

China National Chemicals Import and Export Corp.,
Erh Li Kou, Hsi Chiao,
Peking, People's Republic of China.
Cable: Sinochem Peking.

Organic and inorganic chemicals, chemical raw materials, rubber, rubber tires, and other rubber products, crude petroleum and petroleum and petrochemical products (except aromatics), chemical fertilizers, insecticides, fungicides, antibiotics and pharmaceuticals, medical instruments, apparatus and supplies, dyestuffs, pigments, and paints.

China National Native Produce and Animal By-Products Import and Export Corp.,
82 Tung An Men Street,
Peking, People's Republic of China.
Cable: Chinatuhsu Peking.
Telex No.: 716432 Answerback: Chinative PK432.

Tea, coffee, cocoa, tobacco and cigarettes, fibers (hemp, ramie, jute, sisal, flax, et cetera), rosin, manioc, starches, and seeds, cotton linters and waste, timber, certain papers and forest products, waxes, spices, essential oils, aromatic chemicals, nuts, dried fruits and vegetables, patent medicines and medicinal herbs, fireworks, nursery stock as well as other native produce, including bristles and brushes, horsetails, feathers, down and down products, feathers for decorative use, rabbit hair, goat hair, wool, cashmere, camel hair, casings, hides leathers, fur mattress, fur products, carpets, living animals.

China National Metal and Mineral Import and Export Corp.,
Erh Li Kou Hsi Chiao,
Peking, People's Republic of China.
Cable: Minmetals Peking.

Steel plates, sheets and strip, steel sections, steel pipe and tube, railway materials cast iron products pig iron feroalloys fluorspar limestone nonferrous metals, precious rare metals, ferrous ores, nonferrous ores, rare earths, nonmetallic minerals refractories coal and coke, cement, granite, marble, bricks and other construction materials, and hardware.

China National Light Industrial Products Import and Export Corp.,
82 Tung An Men Street,
Peking, People's Republic of China.
Cable: Industry Peking.
Telex No.: 716430 Answerback: Chinlight PK430.

General merchandise of all kinds, paper, stationery, musical instruments, typewriters, cameras, film, radios, refrigerators, sporting goods, toys, building materials (plywood, insulation board, p.v.c. fittings and pipe, tiles, glass, sanitary ware, et cetera) and electrical appliances, clocks and wristwatches, fishnets, net yarns, leather shoes, leather products, pottery and porcelain, human hair, pearls, precious stones and jewelry, ivory and jade carvings, lacquerware, straw and other plaited articles, furniture, artistic handicrafts, and other handicrafts for daily use.

China National Textiles Import and Export Corp.,
82 Tung An Men Street,
Peking, People's Republic of China.
Cable: Chinatex Peking.
Telex No.: 716428 Answerback: Chitextil PK428.

Cotton, cotton yarns, raw silk, steam filature, wool tops, rayon fibers, synthetic and manmade fibers, cotton piecegoods, woolen piecegoods, linen, garments and wearing apparel, knitted goods, cotton and woolen manufactured goods, readymade silk articles, drawn works.

China National Cereals, Oils and Foodstuffs Import and Export Corp.,
82 Tung An Men Street,
Peking, People's Republic of China.
Cable: Ceroilfood Peking.
Telex No.: 716426 Answerback: Chinafood PK426.

Cereals, edible vegetable and animal oils and fats, vegetable and animal oils and fats for industrial use, oil seeds, seeds, oil cakes, feedingstuffs, salt, edible livestock and poultry, meat and meat products, eggs and egg products, fresh fruit and fruit products, aquatic and marine products, canned goods of various kinds, sugar and sweets, wines, liquors and spirits of various kinds, dairy products, vegetables and condiments, bean flour noodles, grain products, nuts and dried vegetables (some nuts, dried fruits, and vegetables also carried by Native Produce).

China National Machinery Import and Export Corp.,
Erh Li Kou, Hsi Chiao,
Peking, People's Republic of China.
Cable: Machimpex Peking.

Machine tools, presses, hamers, shears, forging machines, diesel engines, gasoline engines, steam turbines, boilers, industrial and institutional refrigeration and air-conditioning equipment, mining machinery, metallurgical machinery, compressors and pumps, hoists, winches and cranes, transport equipment (aircraft, railroad, automotive, ships and parts thereof), power and handtools, agricultural machinery and implements, printing machines, knitting and other textile machines, building machinery, machinery for the chemical, rubber, plastics and other industries, ball and roller bearings, tungsten carbide, electric machinery and equipment, telecommunication equipment, electric and electronic measuring instruments, and scientific instruments (except medical instruments).
line engines, steam turbines, boilers, industrial and institutional refrigeration

China National Technical Import Corp.,
Erh Li Kou, Hsi Chiao,
Peking, People's Republic of China.
Cable: Techimport Peking.

Importation of complete plants and technology.

Appendix II

China's Trade-Related Agencies

China Council for the Promotion of International Trade (CCPIT),
Hsi Tan Bldg.,
Hsi Chang An Chieh,
Peking, People's Republic of China.
Cable: Comtrade Peking.

Although the CCPIT is said to be a ungovernmental "public" organization, it is an important part of China's foreign trade structure. As such it works with the Ministry of Foreign Trade and the FTC's on China's external trade and serves as a liaison between China's trade enterprises and their counterparts abroad.

Its responsibilities include informing foreign trade organizations of China's trade and keeping abreast of developments in foreign markets; arranging economic and trade-related exchanges, which include Chinese exhibitions abroad as well as foreign exhibitions in the PRC; and registration of trademarks. The CCPIT does make "unofficial" trade agreements with foreign organizations in its own name. Through its Foreign Trade Arbitration Commission, Maritime Arbitration Commission, and Department for Average Adjustment, the CCPIT has responsibility for settlement of legal disputes related to foreign trade and maritime affairs.

Chinese Scientific and Technical Association,
Kan-mien Hu-t'ung No. 31,
Peking, People's Republic of China.

With CCPIT, this organization plays a role in and should be consulted in connection with arranging scientific and technical symposia in China.

This association is responsible for plannng scientific research and development. It plays a lead role in organizing and controlling the professional societies, such as the Society of Automation, Society of Electronics, and many others.

China National Foreign Trade Transportation Corp.,
Erh Li Kou, Hsi Chiao,
Peking, People's Republic of China.
Cable: Zhongwaiyun Peking.

Arranges customs clearance and delivery of all import/export cargoes by land, sea, and air, or by post. May act as authorized agents clearing and delivering goods in transit through Chinese ports. Arranges marine and other insurance and institutes claims on behalf of cargo owners on request.

China National Chartering Corp.,
Erh Li Kou, Hsi Chiao,
Peking, People's Republic of China.
Cable: Zhongzu Peking.

Under direction of China National Foreign Trade Transportation Corp., charters foreign vessels and books shipping space required for Chinese import and export cargoes. Also, does similar business on behalf of principals located abroad. Canvasses cargoe for shipowner.

People's Insurance Co. of China,
34 Fan Ti Road.
Peking, People's Republic of China.

Provides international trade and marine risk underwriting at competitive rates. Has overseas agents in leading countries.

Complete Plant Export Corp.,
Fu-Wai Street,
Peking, People's Republic of China.

Exporters only of complete factories, works and production units, usually, but not exclusively, as part of an economic aid agreement.

Guozi Shudian,
P.O. Box 399,
Peking, People's Republic of China.

Export of books and periodicals in Chinese. Arranges subscriptions to Chinese newspapers and periodicals on behalf of foreign readers.

China National Publications Import Corp.,
P.O. Box 88,
Peking, People's Republic of China.

Import of books and periodicals.

Certain oı China's organizations have representative agents in Hong Kong. These agents, their addresses, and the FTC's they represent are as follows:

China Resources Company (CRC),
Bank of China Building,
Des Voeux Road, Central.
Hong Kong.
Cable: Cireco Hong Kong.

CRC represents China National Machinery Import and Export Corp., China National Chemicals Import and Export Corp., China National Metals and Minerals Import and Export Corp., and China National Textile Import and Export Corp.

Ng Fung Hong,
Bank of China Building,
Hong Kong.
Cable: Ng Fung Hong Kong.

Ng Fung Hong represents China National Cereals, Oils and Foodstuffs Import and Export Corp.

Teck Soon Hong Ltd.,
37–39 Connaught Road West,
Hong Kong.
Cable: Stillon Hong Kong.

Teck Soon Hong represents China National Native Produce and Animal By-Products Import and Export Corp., China National Light Industrial Products Import and Export Corp., and China National Textiles Import and Export Corp.

Hua Yuan Co.,
37–39 Cannought Road West,
Hong Kong.
Cable: Hycomp Hong Kong.

Hua Yuan represents China National Light Industrial Products Import and Export Corp., and China National Native Produce and Animal By-Products Import and Export Corp.

Far East Enterprises Corp. (FARENCO),
Bank of China Building,
Des Voeux Road Central,
Hong Kong.

FARENCO represents the China Foreign Trade Transportation Corporation and arranges transshipment of goods to and from the PRC through Hong Kong.

Appendix III

United States-People's Republic of China Trade Statistics [1]

10 LEADING UNITED STATES EXPORTS TO THE PEOPLE'S REPUBLIC OF CHINA, 1974

[By 7-digit schedule B category]

	Amount	Percent of all exports
Wheat, unmilled, except relief	$234,014,893	28.5
Cotton upland, 1-in to 1⅛-in	157,411,015	19.2
Soybeans	140,482,966	17.1
Corn, unmilled, except seed and popcorn	95,671,435	11.4
Aircraft, passenger carrying, commercial, 33,000 lbs and over	33,695,195	4.1
Aircraft, passenger, transport 33,000 lbs and over	16,179,200	2.0
Cotton, upland 1⅛-in and over	15,226,079	1.9
Cotton, upland, under 1 in	12,963,345	1.6
No. 1 heavy metal steel scrap except sheets	9,044,207	1.1
Tallow, inedible	7,538,854	.9
Total, leading 10 exports	722,227,189	88.0
Total, all exports	820,479,497	100.0

10 LEADING UNITED STATES IMPORTS FROM THE PEOPLE'S REPUBLIC OF CHINA, 1974

[By 7-digit TSUSA category]

Piece shirting n.e.s. white cotton, not fancy, bleached or colored	$11,364,491	9.9
Tin other than alloys, unwrought	9,395,564	8.2
Rosin, nonspecified	7,876,325	6.9
Antiques, nonspecified	6,764,925	5.9
Bristles, crude or processed	5,925,012	5.2
Shrimps and prawns, shell on	5,269,761	4.6
ABC sheeting, white cotton, not fancy, bleached or colored, ordinary	4,314,100	3.8
Silk, raw in skeins, etc., n.e.s	2,576,034	2.2
Cigarette, leaf, not stemmed Burley	2,575,776	2.2
Twill n.e.s. white cotton, not fancy, bleached or colored, ordinary	2,490,902	2.2
Total, leading 10 imports	58,552,890	51.1
Total, all imports	114,689,406	100.0

[1] Reproduced by permission, from the U.S. China Business Review, vol. 2, No. 2, March–April 1975, p. 19, published by National Council for United States-China Trade.

REVISED SINO-AMERICAN TRADE FIGURES, 1971–74

[In millions of dollars]

	1971	1972	Percent change	1973	Percent change	1974	Percent change
U.S. exports	0	63.5	----------	[1] 739.7	1,064.9	[2] 820.5	10.7
U.S. imports	4.9	32.4	561.2	63.9	97.2	114.7	79.5
Total	4.9	95.9	1,857.1	803.6	738.0	935.2	16.2

[1] Includes $50,600,000 worth of cotton transshipped through Canada.
[2] Includes $11,700,000 worth of soybeans transshipped through Canada.

Source: NCUSCT based on East-West Trade Bureau Data.

SINO-JAPANESE COMMERCIAL RELATIONS*

By Young C. Kim

I. Overview

Japan has become the People's Republic of China's leading trade partner, accounting for about 20 percent of the PRC's foreign trade turnover in recent years. A unique set of economic and political factors has facilitated a rapid expansion of Sino-Japanese trade in the 1960's and 1970's. First, there is a substantial degree of complementarity between the two economies. Japan is heavily dependent on imports of raw materials to fuel its modern industrial economy, and Japanese industrial leaders consider the PRC a logical supplier of some of their needs. At the same time, foreign trade planners in the PRC have placed a high priority on imports of the kinds of machinery and equipment and industrial manufactures which Japan has the capacity to export. The short, relatively cheap water transport between Japan and China makes the trading relationship especially attractive for exchange of goods in which transport costs represent a large share of the final price. Long water and rail transport to alternative markets in Western Europe and North America involve substantially high transport costs. Their economic complementarity and their geographic proximity create an opportunity for a substantial trade turnover benefiting both countries. The foreign trade potential of certain key industrial sectors which are examined in this paper will be a major determinant of the volume of future Sino-Japanese trade.

Another key determinant of the level of Sino-Japanese trade is the political relationship between the two governments.[1] To a much greater degree than other countries, the PRC's foreign trade has been shaped by its general foreign policy objectives. Consequently, Sino-Japanese commercial relations have been linked to the diplomatic interactions of the four great powers in Asia—the PRC, Japan, the Soviet Union, and the United States. For example, commercial relations have been a centerpiece of the efforts of the Chinese and Soviet governments to win Japanese support for their respective positions in the Sino-Soviet rivalry. In addition, the question of the status of Taiwan has been a major limiting factor on the level of trade. The progress achieved in expanding Japanese-PRC commercial relation has been due in part to Japan's flexibility on the Taiwan issue.

*George D. Holliday assisted the author in drafting this report. The author is also indebted to the editor of the compendium, John P. Hardt, for assistance in structuring the paper. However, the author bears full responsibility for its contents.

[1] See John P. Hardt, George D. Holliday and Young C. Kim, *Western Investment in Communist Economies: A Selected Survey on Economic Interdependence*. Prepared for the U.S. Senate, Committee on Foreign Relations, Subcommittee on Multinational Corporations, 93d Congress, 2d sess., August 5, 1974. Washington, U.S. Government Printing Office, pp. 51–55.

The PRC's insistence on independence in its commerical relations with other countries and self-reliance in its approach to economic development has been an important limiting factor in the trade with Japan. These guiding principles of the PRC's foreign trade have restricted the use of the types of industrial cooperation that have facilitated economic relations between other countries, including most other Communist countries. Foreign investments, joint development of resources and other devices for attracting foreign capital have been prohibited. The PRC government has been cautious in its approach to foreign credits, though they have become more acceptable in recent years.

The strategy of independence and self-reliance has been shaped in part by the unhappy past experience with involvement of foreign powers in the Chinese economy. Foreign involvement in the pre-Revolutionary Chinese economy is remembered as a means of foreign exploitation and control. Japan's pre-World War II economic policy toward China is a bitter memory for PRC leaders and undoubtedly conditions their attitude toward Sino-Japanese commercial relations today. The postwar economic ties to the Soviet Union, perceived by the leadership to be an unequal relationship, has also helped to shape the PRC's foreign economic policy.

This paper will examine the implications of each of these determinants of Sino-Japanese commercial relations. The paper consists of three sections. The first will deal with the basic principles of the People's Republic of China's foreign trade. The second is devoted to an examination of selected sectors of the Chinese economy which figure prominently in her trade with Japan. An attempt will be made to review the state of those sectors and to examine their potentials for Sino-Japanese trade. The third section will discuss major factors—primarily noneconomic—which will condition Sino-Japanese trade in the future.

This paper is intended to present Japanese views on Sino-Japanese commercial relations. It draws mainly on two sources of data: interviews with a number of Japanese specialists, conducted by the author in December 1974, and Japanese-language publications. Of numerous publications consulted, the author relies particularly heavily on a series of excellent volumes prepared by the Japan-China Economic Association. (*Nitchu Keizai Kyokai*), referenced at the end of the chapter.

II. Basic Principles of China's Foreign Trade

The foreign trade policy of China is fundamentally governed by requirements for construction of a socialist economy. In the construction of socialism, the PRC has adhered to the principle of independence and self-reliance. Self-reliance consists of carrying out socialist construction by methodically and fully utilizing the country's own material and human resources. This principle is not to be construed as meaning a closed economy or a policy of self-sufficiency. Foreign trade is said to be conducted in accordance with a national plan taking into account the principle of a balanced development of the national economy, import demand, and export capability. The Chinese leadership maintains that foreign trade must be based on the principle of equality and mutual benefit: countries should exchange goods according to their mutual needs and their production capabilities on the basis of international prices.

The foreign trade policy of the PRC is also shaped by, and grounded in, foreign policy objectives. Foreign trade is considered one of the most important means of promoting peaceful coexistence among countries with differing social systems. One of the PRC leadership's five principles of peaceful coexistence (equality and mutual benefits) forms a basis for PRC foreign trade policy. The principle of nonseparability of politics and economics has been a characteristic of PRC foreign trade.

The basic considerations shaping decisions on imports and exports are:

(1) Imports are utilized for the purpose of meeting demand for industrial and agricultural production. Decisions on the type and quantity of imports are influenced by financial resources, domestic demand, ability to meet demand, and the desire to protect domestic industries.

(2) The PRC exports in order to pay for essential imports. Decisions on the type and quantity of exports are influenced by export capacity, the principle of maintaining a balance between exports and imports, the significance of the commodity to domestic production, and the welfare of the people.

Foreign trade is intended to support independent efforts toward economic development. It is not intended to stimulate economic growth nor to promote the development of the consumer goods industry.

The PRC attempts to achieve a balance in its foreign trade—both in its bilateral accounts with individual countries and overall. However, the development of imbalance in a given period is deemed normal and unavoidable.

The PRC has consistently rejected the idea of joint development. Developing resources jointly with a foreign country is viewed as a violation of the principle of self-reliance. In addition, acceptance of foreign assistance risks placing the Chinese economy under foreign control.

In August 1972, a high-ranking trade official told a visiting Japanese Mitsubishi delegation that the PRC would not allow foreign investment in China and that the PRC itself would not export capital to foreign countries. He also made it clear that the PRC did not plan to become a supplier of resources and did not intend to allow foreign exploitation of their resources. Commenting on China's oil resources, he added that China was prepared to export any surplus but that it would not adopt a policy under which Japan could receive oil in payment for capital investments in the Chinese petroleum industry.[2]

The PRC until recently had avoided the use of foreign loans fearing it would jeopardize their independence. Only recently has the PRC begun to use some loans for imports. These loans are designated as "deferred payments". The interest the PRC has been prepared to pay is very low, never exceeding the level of 6 percent per annum. This compels China's trade partners to seek government assistance in financing a large sale to China.

Another principle adhered to by the Chinese government is its refusal to allow China to become a market for consumer goods. In view of the principle that foreign trade is intended to develop domestic

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[2] Nitchu Keizai Kyokai, *Nitchu Keizai Koryu no Kinen*, 1974, pp. 103–104.

agriculture and industry, the insignificance of imports of consumer goods is to be expected. Grains are imported on a large scale, but few other consumer goods are being imported. It is expected that the PRC will continue to adhere to this principle for the foreseeable future.

The foreign trade policy of the PRC is in sharp contrast to that of the Soviet Union. Both countries speak of the principle of equality and mutual benefits, but fundamental differences exist. In theory, Soviet foreign trade is based on the rational location of production facilities and the efficient use of labor and material resources within the socialist system. The Soviet Union promotes COMECON on the basis of an international division of labor and specialization. In contrast, the PRC advocates self-reliance. The PRC condemns the Soviet version of economic cooperation as economic domination and the Soviet version of internationalism as national egotism.

The Chinese claim that the Soviet Union is selling its products and materials to COMECON countries at prices that are higher than international ones and obtaining goods from these countries at a low price level. Under this system of double exploitation, Mongolia has been turned into a "Soviet ranch," Bulgaria into a "Soviet orchard" and Czechoslovakia into a "processing factory" attached to the Soviet Union, and this process, it is claimed, results in deformed development of the economies of these countries.

The PRC perceives the nature of trade between capitalist countries as differing from trade between socialist countries. The former is characterized as a "trade war," with each capitalist country seeking monopolistic control of markets, supplies of raw materials, and labor. The developing countries have thus been "stooges" in rivalries among the major capitalist nations and have been subjected to exploitation. Trade among socialist countries and the developing countries should not be one of plunder and exploitation, but should be based on friendship and mutual assistance. Soviet policy toward East European countries and the developing countries is also based on exploitation and in no way differs from major capitalist countries, being based also on exploitation. The Chinese maintain that the Soviet theory of "international division of labor" is the theoretical basis for perpetuating an unequal foreign trade system.

The PRC maintains that any socialist nation must pursue self-reliance. By doing so, the power of the entire socialist camp is strengthened. It holds that socialist construction based on self-reliance is a concrete manifestation of proletarian internationalism. In the Chinese view, self-reliance means the development of agriculture as a foundation and industry as the guiding hand of the economy. This development strategy, it is claimed, makes it unnecessary to plunder other countries, since a country's agricultural products constitute the source of wealth for socialist construction.

The Chinese emphasize that self-reliance is not meant to exclude trade relations. Rather, they see it as a means of avoiding domination by large foreign economic powers, while receiving the benefits of trade. They place special emphasis on the importance of developing trade relations among African and Asian countries.

The Soviets view the Chinese theory of self-reliance as a design to create an Afro-Asian community led by the PRC. The slogan "self-reliance," according to the Soviet view, would have a progressive meaning for the developing countries if it were interpreted from the position of anti-imperialism. However, as interpreted by the Chinese, its connotation is narrowly nationalistic, antisocialistic, and anti-Soviet.

How do the PRC leadership's basic principles of foreign trade affect Chinese imports of technology and Chinese exports of resources such as oil? The Chinese have explained the introduction of foreign equipment and technology as a means of hastening self-reliance and socialistic construction, since these items serve China's interests. Their view is that self-reliance does not mean that the Chinese will not be willing to learn from advanced experience. They claim that it is necessary to introduce foreign advanced technology to "a reasonable or proper extent." However, they emphasize that one should not place "blind faith" in foreign ideas and supplies, but should maintain "the right guiding philosophy and scientific attitude." Thus, the important policy question for the PRC's leaders is not whether foreign technology should be imported, but how to select and use it to best meet their domestic economic goals.

Despite the principle of nonexport of resources, the PRC has exported oil from the Taching fields to Japan. The PRC principle that it will not become a supplier of resources does not completely preclude exports of resources. Based on conversations with the Chinese authorities, the Japanese Government has received the following impressions:

(1) The PRC will independently develop resources needed for its own economic development.

(2) If China acquires the capacity for supply, as a result of development, it is prepared to supply foreign countries, including Japan.

(3) Although it will not accept joint development, China will import superior foreign technology, in order to develop its resources.

Japanese business circles believe that the PRC leaders have made a decision to become a stable supplier of oil to Japan, as long as the PRC has an exportable surplus and political relations between the two countries remain friendly.

III. Potential Trade in Selected Economic Sectors

Petroleum Exploration and Production [3]

With China apparently taking the initiative, a contract was signed on April 10, 1973 providing for the export of 1 million tons of Chinese crude oil to Japan. The contract specified crude oil produced in Taching which is similar in quality to Minas crude produced in Indonesia. The low-sulfur content of this crude oil is its outstanding feature.

In November 1971, Chou En-lai reportedly suggested to a visiting Japanese economic delegation that Japan, deficient in resources, would benefit by relying on China rather than the "undependable" Soviet Union.[4] A member of another Japanese economic mission visiting China in August 1972 asked Chou En-lai specifically about the possibility of China exporting crude oil to Japan. The Japanese were officially notified in the fall of 1972 that China was prepared to export crude oil to Japan. An Asahi correspondent in Peking reported on

[3] Cf. Bobby A. Williams, "The Chinese Petroleum Industry: Growth and Prospects," above.

[4] Nitchu Keizai Kyokai, *Nitchu Keizai Koryu no Genjo to Tembo*, 1974, p. 284.

December 30, 1973 that, according to a Chinese source, China's oil output had considerably increased and she could export 5 million tons of crude annually to Japan if sufficient pipes and port facilities were ready.

The Japanese have shown intense interest in the prospect of importing Chinese crude oil. The oil crisis in the fall of 1973 accentuated Japan's sensitivity to the needs for diversification of sources for crude oil supply. Since the normalization of relations between the countries occurred in September 1972, Japan's expectation for Chinese crude oil have intensified. Over the short term, the amount of Chinese crude oil available to Japan will be heavily influenced by political considerations. In the long run, China's policy on exporting crude oil supply will be shaped by her reserves and production and transportation capacities. The prospects for China becoming a long-term and stable supply source are assessed below.

Of the many estimates available on China's oil reserves, some are particularly noteworthy. The last official figures made available by China in 1966 indicate that Chinese reserves of class A and B crude amounted to 1 billion tons, and class C reserves were set at 6 billion tons. More recently (1968), A. A. Meyerhoff estimates that China has a potential 780 million tons for crude for "probable ultimate recovery from known fields" and 2.7 billion tons of "total proved, plus probable, plus potential." He estimates that China is capable of producing 135 million tons annually for 20 years. This estimate is conservative, as it has not taken into account future inland and offshore field explorations. One Japanese estimate of the Pohai area offshore reserve, which is now being explored, is 9 billion tons.[5]

Since the Chinese government has not released systematic data since 1960, varying estimates are available on its total crude production. Estimates for 1973 production ranged from 35 million to 40 million tons. On January 4, 1974, Chou En-lai told Ohira, then the Japanese Foreign Minister, that China's annual production of crude was 50 million tons.[6] Japanese estimates for 1974 and 1975 are 60 million and 70 million tons, respectively.

It is generally believed that China's refining capacity is limited in relation to her output, but a Japanese source rejects this view, estimating that by 1972 China had acquired a refining capacity of 40 to 50 million tons. Most Japanese observers estimate Chinese refining capacity to be between 30 and 40 million tons.

The Japanese duly noted a recent article in People's Daily (January 3, 1974) in which China claimed to be rich in oil resources. The Chinese article claimed that many oilfields had been uncovered during that past 10 years, that the prospect for seabed oilfields on the continental shelf were good.

The Japanese are impressed with the enthusiasm the Chinese show regarding the exploration of oil resources on the continental shelf. They believe that the Chinese will attempt to export a large quantity of crude oil to compensate for the trade deficit incurred due to the import of a large number of whole plants. The Japanese are convinced that China would increase the volume of crude exports if serious transportation problems could be overcome. Current port facilities are in-

[5] *Ibid.*, p. 287.
[6] *Ibid.*, p. 295.

adequate, requiring the use of less than 20,000-ton tankers. Pipelines are also inadequate. The Chinese have been making every effort to expand port facilities and to build new pipelines. Japan has provided machinery and equipment for pipeline construction and sold about 70 vessels (40 billion yen) to China for expansion of port facilities. China has rejected several inquiries and proposals by the Japanese concerning joint development of offshore oil resources in Pohai and in the East China Sea, adhering to a policy of self-reliance.

The Japanese expect the PRC to intensify its "oil diplomacy" in an effort to offset the influence which the Soviet Union might gain if prospective contracts for the export of large amounts of Siberian oil to Japan are concluded. However, Chinese domestic needs might create a major constraint on China's ability to export. The Japanese believe that the large number of petrochemical plants purchased by China in recent years will increase rapidly domestic needs for oil.

Another constraint on exports might be shortfalls in domestic production of vital inputs for the oil idustry. For example, expansion of oil production is heavily dependent on increasing iron and steel imports. Iron and steel are needed for oil exploration equipment, pipes, and other transportation equipment, and storage facilities. Thus, a comparison of the growth rates of the iron and steel industry and the oil industry is indicative of some of the problems China faces in expanding output. In the past, the Chinese Government indicated that it planned to expand crude steel production and crude oil production at the same rate. However, oil production grew twice as fast as steel production in 1973.[7] This suggests the possible development of a bottleneck which, if not met by imports, could reduce the growth in oil production.

The Japanese are nonetheless optimistic about future Chinese oil production. One estimate is that production might exceed 450 million tons by 1990, making China one of the five major oil-producing nations (along with Saudi Arabia, Iran, the United States, and the Soviet Union.)[8] This projection is based on the following factors:

(1) Availability of resources. Based on resources discovered by the end of 1973 alone, China appears to have sufficient resources for exploitation through the mid-1980's.

(2) Problems in oilfield construction. The rate of development of oilfields in the Pohai Bay would affect the estimate. However, oil reserves are found in shallow water (less than 20 meters), and China is expected to maintain the current exploitation rate of approximately one-half of the inland fields.

(3) Problems of technology. China is capable of importing the technology needed to overcome problems related to offshore drilling.

(4) Capital. Total expenses required for 15 years are estimated at around $15 billion. An annual investment of $1 billion would not pose a major impediment.

(5) Problems of related facilities. The problem of increasing all the related facilities (in the range of 16 percent annually) would be the greatest obstacle. This factor, however, would depend on the level of exports. If 30 percent of production is exported, for example, related facilities would have to be expanded by 5.3 times in 15 years.

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[7] *Ibid.*, pp. 306–309.
[8] *Chugoku Keizai Kenkyu Geppo*, September 1974, pp. 12–14.

Most observers believe that only 10 percent of production is likely to be exported.

The primary concern for Japanese analysts is naturally the amount of oil which China can export to Japan in the future. There are widely varying estimates. China's exportable surplus from the Taching fields alone, which are approaching their final output target of 30 million tons a year, is expected to be 10 million tons. One Japanese estimate puts total 1978 Chinese production at 150 million tons, allowing possible exports to Japan of 25 million tons.[9] Chinese officials have apparently encouraged such speculation. One Chinese official is reported to have intimated that exports to Japan should be increased to 30 million tons when Chinese output reaches 100 million tons.

Future exports to Japan will depend on a number of variables which are difficult to predict. However, the Japanese believe that there is a compelling logic for China to allocate a large proportion of future production to export. Oil exports will be an increasingly important tool for Chinese leaders to achieve their political and diplomatic goals. To make it an effective tool in its foreign policy toward Japan, a considerable increase would be necessary. Moreover, oil represents China's most valuable means of earning sufficient hard currency to pay for needed imports of food grains and high technology machinery and equipment. If the PRC's exports reach the levels predicted by some Japanese sources, they could earn the following amounts (at $12.85 per barrel) in future years:

	Billions
1978—45 million tons	$4
1985—100 million tons	9
1988—135 million tons	12

Chinese oil exports to Japan have already had a significant impact on the volume and structure of their bilateral trade. Recently, oil exports have expanded rapidly, while traditional exports have declined. Preliminary estimates for 1974 indicated that Chinese exports to Japan would increase by 47 percent over the previous year and that 90 percent of the increment would be due to growth in oil exports. Oil exports were expected to account for 30 percent of the PRC's exports to Japan in 1974 and over 50 percent in 1975.

The Iron and Steel Industry [10]

Chinese steel production was 21 million tons for 1971 and 23 million tons for 1972. The figure for 1973 is estimated to be 25–26 million tons. In recent years, China has depended on iron and steel imports for 12 to 13 percent of its consumption. China ranks seventh among steel-producing nations.

Proven resources of iron ore and coal have considerably increased and the estimate of iron ore resources now range from 12 billion to 36 billion tons. Chinese production for 1970 was 24 million tons, making China the fifth largest producer in the world. In terms of coal reserves (including "estimated reserves") China ranks third and is estimated to have about 1½ trillion tons.

[9] Nitchu Keizai Kyokai, *Chugoku no Sangyo Kozo*, 1974, p. 305.
[10] Cf. Alfred H. Usack, Jr. and James D. Egan, "China's Iron and Steel Industry," above.

Per capita consumption constitutes only about one-tenth of that of the United States, Japan, or the Soviet Union, suggesting a vast potential demand. Some estimates of China's projected demands for crude steel for 1980 are available. Assuming an 8-percent growth rate in national income, Chinese demand would approach 61.6 million tons. The amount would reach the level of 75.1 million tons if a 10-percent growth rate is assumed.

As to China's supply capacity, crude steel production in 1980 would reach 39 million tons if an annual increment of 2 million tons is assumed. This would create an enormous dependence on imports, ranging from 22.6 million to 35.1 million, constituting 36.7 percent and 48 percent respectively, of total consumption. These figures would probably be unacceptable for China, in view of the leadership's desire to reduce dependence on foreign economic powers. Thus, Japanese observers expect China to limit its imports to 15–20 percent of its consumption.

Iron and steel accounts for 15 percent of China's total imports and ranks among the most important import items, along with machinery and chemicals. China is the eighth largest importer of steel, importing 2.27 million tons in 1972. Of the total world trade in steel (95 million tons), Chinese imports constituted 2.4 percent in 1972. Iron and steel imports from Japan have consistently accounted for over 60 percent of China's total iron and steel imports. Given the competitiveness of Japan's steel industry and the export capacity of other steel-producing nations, Japan's dominant share of China's market will undoubtedly continue.

Since 1968 Japan has exported over 1 million tons of iron and steel annually and China is Japan's second largest customer (the United States is the largest). Japan exported 1.4 million tons in 1972—7–8 percent of its total steel exports. Iron and steel account for over 40 percent of Japan's total exports to China, being the single largest export item. Thus, China is an important and stable market for the Japanese iron and steel industry.

The large volume of Sino-Japanese trade in iron and steel can be ascribed to several factors: the coincidence of China's increased demands and Japan's production capacity; geographical proximity; the quality of Japanese product; Japan's reputation for making deliveries on time; and a relatively low price.

Apart from the question of China's continued demands, there is some question regarding Japan's export capacity. Japan's steel production will face numerous difficulties—environmental problems, energy problems, labor problems—and may be unable to maintain its high rate of growth. On the other hand, demands—both domestic and external—are expected to continue to be high, and it will be difficult to meet these demands. Moreover, the Japanese are dissatisfied that the price of steel bound for China has always been lower than that charged for steel export to other areas. Japan hopes to adjust this disparity.

Japan's annual steel production is about to reach 120 million tons. As many countries move toward self-sufficiency in iron and steel production, the role of Japan will tend to change from that of supplier to one of a provider of technical assistance. However, for the present time, Japan will continue its role as a major supplier. According to one estimate, Japan's production of crude steel will reach 145–155 million tons in 1977.[11]

A few observations are in order regarding Japan's imports of iron ore and coal from China. Prior to World War II, Japan had long depended on China for iron ore and coal. Japan's resumption of imports of coal began on a very small scale in 1947 but again were interrupted by the outbreak of the Korean War. The resumption of Sino-Japanese trade saw a graduate increment in Japanese imports of raw materials for steel, and a long-term contract was concluded in February 1958. Trade was again interrupted from May 1958 until 1960. In the latter years, Japanese "friendly firms" began a modest level of trade with the PRC. The conclusion of a long-term agreement in 1962 further expanded the volume of trade, but Japan's imports of steel-related raw materials showed only a marginal increase.

Japan's imports of Chinese coal ended in 1968, and imports of iron ore ceased in 1969. Japanese imports of other raw materials related to steel production for the year 1972 constituted only 3 percent of her total imports from China. From China's viewpoint, the amount comprised only 0.5 percent of total exports. The following reasons are cited by Japanese specialists to explain the low level of China's exports of these raw materials:

(1) China's policy regarding the relative priority between industry and agriculture has fluctuated.

(2) Allocation of machinery and goods necessary for mining was not sufficient to promote adequate development of industrial materials.

(3) Domestic demand leaves little for export.

(4) The Cultural Revolution severely disrupted some economic sectors, especially transportation.

(5) The PRC leadership has shown a desire to protect its resources and has adopted a cautious attitude toward exporting them. The Japanese see some indication of change in this aspect of Chinese policy.

Chinese sources indicate that iron ore reserves as of 1958 were 36 billion tons. China's iron ore is lower in quality (30–40 percent in iron content) than the iron ore Japan is currently importing from other countries. The low quality does not constitute a major impediment to Sino-Japanese trade, since technical methods for rectifying low-quality ore are available. Transportation poses a more serious problem. The long distance to the coast is compounded by inadequate port facilities which require the use of small vessels (under 10,000 tons), thus increasing transportation costs. China's decision to export iron ore would necessitate the construction of port facilities capable of handling vessels of 30,000–50,000 tons. It remains questionable, however, whether Chinese industry can produce an exportable surplus in the foreseeable future. Thus, Japan's long-term demand is likely to be met by sources other than China.

Chinese authorities announced in 1958 that its coal reserves were estimated to be 1½ trillion tons. Since the Revolution, the coal mining industry has made steady progress, but a deficiency in coal has been conspicuous since the latter half of the 1950's. This is due largely to

[11] Nitchu Keizai Kyokai, *Nitchu Keizai Koryu no Genjo to Tembo*, 1974, p. 347.

China's dependence on coal for 90 percent of its primary energy. There has been an expansion of coal consumption in various industries, as well as an increased demand in the rural villages. China's official position is that it has no export capacity, and that the coal mining industry is undergoing reconstruction. The level of coal production has risen sharply since 1970, exceeding 500 million tons in 1972.

China's coking coal has a high content of ash, sulfur, and water and is inferior to the type of coal Japan has been importing from other countries. In addition to China's lack of an exportable surplus at this time, the Japanese identify the low quality of Chinese coal and high transportation costs as major barriers to a resumption of Japanese imports.

Japanese demand for coal is currently being met by sources other than China. However, the Japanese consider it feasible that China could develop an exportable surplus and overcome the problems related to transportation of coal. Thus, they see China as a possible future source for coal.

Chinese reserves of fluorite constitute 5.8 percent of world reserves and its output constitutes 6.5 percent of total world output. China exports 50 percent of its total output, and half of the exports are destined for Japan. After the cessation of iron ore and coal imports from China, fluorite has been the most important item sustaining a link between China and Japan's steel industry. Fluorite is an essential item for such industries as iron and steel, aluminum, and cement and is a scarce world resource. Hence, Japan will continue to depend on China for a considerable quantity of fluorite in the future.

Chemicals

The pattern of China's trade in chemicals in recent years shows that imports exceed exports by a ratio of 3 to 1—a pattern characteristic of developing nations.

China's exports of chemicals to OECD countries increased from $38 million in 1967 to $62 million in 1970 (cif). Japan received 37 percent of China's exports in 1970. China's imports from these OECD countries (f.o.b.) increased to $256 mililon in 1971 from $223 million in 1967. China's imports from Japan and West Germany increased during 1967–70, but imports from other countries decreased. China has declined as a market for chemicals from OECD countries as a whole. China's exports of chemicals constituted 5 percent of her total exports. While socialist countries received decreasing amounts, OECD countries received an increasing proportion of Chinese chemical exports. Japan's increased share is particularly noteworthy: it amounted to 23 percent of the total OECD share in 1967 and 37 percent in 1970.

Of Chinese chemical exports to Japan, rosin is the principal commodity. Japan's exports of chemicals to China amounted to 57.4 billion yen and 61.3 billion yen in 1971 and 1972 respectively. In terms of composition, chemical fertilizer accounts for over 60 percent of the chemicals. Japan's export of chemicals to China constituted 28.5 percent, 32 percent, and 21 percent of its total exports to China in 1971, 1972, and 1973 respectively. After iron and steel, chemicals are the major Japanese exports to China.

China imports far more chemicals than it exports. Imported chemicals are primarily industrial commodities, whereas most of China's chemical exports are natural products. 97 percent of its imports come from nonsocialist countries.

Although the technological level of the Chinese chemical industry is currently very low, the Japanese believe that it will improve rapidly in terms of quality and volume of output. China has sufficient labor and raw material inputs and lacks only modern machinery and equipment. The PRC leadership is attempting to remedy this deficiency by importing Western technology, including whole plants. Most Japanese observers believe that China will move rapidly toward self-sufficiency in chemicals and that Japan will have to find alternative markets for its chemical exports.

Since the normalization of Sino-Japanese relations, Japan has been a major supplier of chemical plants to China. China has purchased plants for production of a wide variety of chemicals, with special emphasis on synthetic fibers and chemical fertilizers. The Japanese note that the rapid introduction of a series of chemical plants has created an imbalance in the level of technology between the modern plants and complementary industries. They believe that the Chinese will have serious problems in adopting the new chemical technologies to other parts of the economy.

The Chinese leadership's interest in chemical fertilizer plants is not surprising in view of the dominance of agriculture in the Chinese economy. About 80 percent of the population is engaged in agriculture. While production of food for China's huge population is the main task of the agricultural sector, it also produces about 70 percent of the raw material inputs for light industry. Agricultural products also comprise 70–80 percent of China's exports. Increases in agricultural output depend on increases in land productivity through increased mechanization and increased use of fertilizer.

Stability and self-sufficiency in food production has received the highest priority of Chinese economic planners, and consequently they have allocated substantial capital investments to chemical fertilizer production. Relatively large-scale plants were constructed during the First Five-Year Plan (1953–57), mostly with Soviet technical assistance. Beginning in 1958, small-scale plants were constructed by Chinese technicians. Imports of ammonia and urea plants from the West occurred during 1963–65. The import of plants practically ceased during the Cultural Revolution, but resumed in the fall of 1972.

The resumption of imports of fertilizer plants was necessitated by China's inability to produce enough fertilizers for its agricultural sector. Chou En-lai told Edgar Snow that China produced 14 million tons of nitrogen fertilizer in 1970.[12] Subsequently, the Chinese Government announced increases of 20.2 percent and 18 percent in 1971 and 1972 respectively, indicating a total production of 19.8 million tons for 1972. A Japanese source gives a lower estimate of 18.6 million tons of nitrogen fertilizer for 1972.[13] China is the fourth largest producer of nitrogen fertilizer in the world, following the United States, the Soviet Union, and Japan.

Despite large investments, China has been able to meet its domestic needs. According to estimates by the Food and Agriculture Orga-

[12] Nitchu Keizai Kyokai, *Nitchu Keizai Koryu no Genjo to Tembo,* 1974, p. 248.
[13] *Ibid.,* pp. 248–249.

nization, China's consumption of fertilizer in 1971–72 was 3.3 million tons of nitrogen, 690,000 nitrogen tons of superphosphate, and 143,000 tons of kalifertilizer. 1972 consumption represented an increase of 2.5 times in 6 years. Still, the amount of nitrogen fertilizer applied per hectare in China was only one-sixth the amount used in Japan.

To meet its deficiency in fertilizers, China has restored to large-scale imports. In 1972 it was the largest importer of nitrogen fertilizers in the world, accounting for 22 percent of total world trade. Japan is the primary source for China's fertilizer imports, providing 79 percent in 1972.

Japan is a natural source for China's imports. Japan's rapidly expanding fertilizer production has outstripped domestic demand. Exports accounted for 50 percent of 1966–67 output and 70 percent of 1972–73 output. Most of Japan's fertilizer is destined for Asian countries with a large proportion going to China (65 percent in 1972–73). The degree of Japan's dependency on China as a market for its fertilizer exports was accentuated when Taiwan and South Korea became self-sufficient in nitrogen fertilizer. Japan's exports to China in 1970 was 5.47 million tons and in 1971 5.38 million tons. The figures for 1972 and 1973 were 4.18 and 3.8 million tons respectively. The decline since 1972 was due to a sudden increase in domestic demand.

A number of factors have contributed to China's desire to import fertilizer plants. The import of whole plants is more in keeping with China's policy of self-sufficiency. The PRC leadership appears to believe that it is unsafe to depend on foreign suppliers of such an essential commodity. That belief was undoubtedly confirmed by a worldwide shortage of chemicals in 1973, during which China was unable to obtain the required amount of fertilizer. Moreover, sharp price increases resulted in increased expenditures of scarce hard currency reserves and probably had a negative impact on domestic economic planning.

China's reliance on Japan as a supplier of fertilizer plants is probably a result of both economic and political factors. (1) Normalization of relations between the two countries has provided a political environment conducive to a long-term, stable development of Sino-Japanese trade. (2) Following normalization, export-import bank financing has become possible. Moreover, Japanese firms have taken a positive attitude toward Sino-Japanese trade. Their view is that, even though trade with China may not be very attractive or lucrative at present, cordial relations with the PRC will serve their long-term interests. (3) From the Chinese viewpoint, such factors as low transportation costs, the level of Japanese technology, and political considerations appear to have been involved.

Textile Industry

The textile industry is the most important export industry for China. However, the level of domestic production is not adequate to meet internal demand. Per capita fiber consumption is 2.1 kilograms per year, about one-third of the world's average. Cotton cloth is still rationed in China, with a per capita ratio of about 6 to 9 meters per year. Japanese observers believe that there is litttle prospect of China achieving self-sufficiency in cotton in the near future. China's dependence on imports of cotton increased from 3.7 percent to 8.4 percent of total domestic consumption between 1968–69 and 1971–72. Because of poor weather conditions, 19.5 percent of China's cotton consumption was imported in 1972–73.

Cotton accounts for over 80 percent of total Chinese textile production, with 90 percent of production allocated for domestic purposes. Synthetic fiber production has been increasing rapidly since 1960, but it constitutes only about 10 percent of total textile production. Total synthetic fiber production was 154.5 million pounds in 1972, and is expected to increase rapidly. However, synthetics will continue to be a small part of total textile production.

In 1970, textiles accounted for 29 percent of China's foreign trade turnover. Exports of textile products (including clothing) totaled $495 million—about 60 percent of total industrial goods exported in that year; 33.8 percent of Chinese textile exports in 1970 went to Western industrial countries, 29.6 percent to Communist countries, and 27.8 percent to developing countries. Japan was the largest market, accounting for 10.5 percent of Chinese textile exports. Most of China's textile imports in 1970 came from the developing countries (60.9 percent) and the industrial West (38.5 percent). Japan with 14.4 percent, was the largest supplier of textiles to China.

While Japan still has a surplus in its overall trade with China—$67 million in 1973—the surplus is declining, largely because of increasing imports of Chinese textiles. China exported $93 million of textiles to Japan in 1971, $198 million in 1972, and $430 milllion in 1973. Textiles accounted for a large proportion of China's exports to Japan in each year: 28.9 percent in 1971, 40.3 percent in 1972, and 44.1 percent in 1973.

IV. Prospects for Sino-Japanese Trade

The establishment of diplomatic relations between Japan and the PRC in September 1972 provided the political basis for expansion of commercial relations. It was followed, in January 1974, by a bilateral trade agreement, which represented a concrete manifestation of the spirit of the Japan-China Joint Communique of 1972. The trade agreement resolved a number of legal and practical problems in Sino-Japanese commercial relations. It provided for reciprocal extension of most-favored-nation treatment in matter of tariffs, domestic taxes, and fees. It also set guidelines for payments in trade transactions: yen, ren min bi, or any convertible currency agreed to by both countries may be used. Other important provisions call for promotion of technical exchanges and holding of trade fairs.

There were some notable omissions in the trade agreement. To the disappointment of the Japanese side, no provision is made on the entry of Japanese businessmen into China and their legal status while residing in China. Nor is any provision made for protection of industrial ownership rights. The concept of a patent, for example, is alien to the Chinese. The Chinese maintain that technology, whether invented in China or imported from abroad, belongs to the people and, thus, must not be restricted. Japanese businessmen have reported great difficulty in making the Chinese understand the various restrictions related to patents. However, they have succeeded in inserting into individual contracts a stipulation that certain technical information should not be transferred to third parties. Another unresolved problem is pricing. While the trade agreement provides generally for trade based on equality and mutual benefit and proper international prices, it offers no specific guidelines.

The Japanese Ministry of International Trade and Industry estimated in June 1972 that by 1980 China' total foreign trade turnover would reach $12 billion and Sino-Japanese trade would reach $3.2 billion.[14] After the rapid increase in Sino-Japanese trade in 1973, many Japanese observers believe that the 1980 total will be much higher than estimated. In speculating on the future of Sino-Japanese trade, the Japanese stress the importance of a number of economic and political variables.

Sino-Japanese Diplomatic Relations

Generally speaking, the state of bilateral political relations is and is expected to remain in the near future conducive to an expansion of commercial relations. The establishment of diplomatic relations, followed by agreements on trade, maritime transportation, and aviation, are considered indicative of a long-term trend of improving relations. While conclusion of a treaty of peace and amity will not materialize as easily, the existing political arrangements between the two countries provide an adequate framework for expanding commercial relations.

Interaction of Four Major Powers

The diplomatic interaction of the United States, the Soviet Union, the PRC, and Japan are expected to continue to provide incentives for the Chinese and Japanese Governments to increase the level of economic interchange. The prospect of increasing deliveries of Chinese oil to Japan is illustrative of the political implications of expanding commercial relations.

The course of United States-Soviet relations is a key element in this interaction. Recent restrictions on U.S. Export-Import Bank loans to the Soviet Union, for example, make Japan's participation in major joint projects for development of Siberian raw materials difficult and unlikely. The reduced likelihood of Japan's massive involvement in Siberian projects, in turn, will probably influence Sino-Japanese economic relations, though it is uncertain whether this development will tend to increase or decrease the volume of commercial exchanges. On the one hand, if prospective Japanese-Soviet joint projects do not materialize, the Japanese might be reluctant to risk developing closer ties to the PRC, for fear of antagonizing the Soviet leadership. Likewise, the PRC leadership might have a reduced incentive to expand economic relations with Japan. On the other hand, the effect could be just the opposite. Japan's need for raw materials might make the leadership more inclined to strengthen economic ties to China, while the Chinese leadership might deem it necessary to cultivate those ties in order to convince the Japanese that Japan's future interests lie in avoiding dependence on the Soviet Union. On balance, it seems likely that reduced Japanese prospects in Siberia will tend to stimulate its commercial relations with the PRC.

[14] Nitchu Keizai Kyokai, *Nitchu Keizai Koryu no Rinem*, 1974, pp. 170–171.

Balance of Trade

The large Japanese surpluses in trade with China appear to be diminishing. 1973 trade showed a rough balance, and some Japanese observers believe that the trade balance might shift in China's favor in a few years. Given the Chinese leadership's penchant for balancing its trade on a bilateral basis, the new trend augurs well for a further expansion of trade.

Economic Complementarity

The complementary structures of the Chinese and Japanese economies offer a great potential for mutually beneficial trade. The Japanese attach particular significance to the fact that commercial exchanges are taking place in a wide range of economic activities. Most major Japanese firms are becoming involved in the China trade.

Prices

Disagreements over prices for manufactured goods and raw materials have tended to impede the expansion of commercial relations. While this problem is not unique to Sino-Japanese trade, Japanese businessmen have expressed particular concern about its effect on their trade with China.

Taiwan

While the normalization of Sino-Japanese relations provides a political basis for expanded commercial relations, the issue of Japanese relations with Taiwan will have an important bearing. Japan's diplomatic relations with Taiwan were severed in September 1972, while commercial relations continued. The important issue in the future is not Japan's commercial relations with Taiwan, which the PRC condones, but the Japanese Government's political relations with Taiwan. Even in the absence of formal diplomatic relations, there is a range of policies and actions that the Japanese Government may follow in deference to the Government of Taiwan that might impede further improvement in relations between Japan and the PRC.

For example, great political significance was attached to Japanese Foreign Minister Masayoshi Ohira's announcement that the Nationalist Chinese flag emblem on Taiwan's China Airlines planes would no longer be considered as a "national flag." While the Japanese Government is unlikely to reverse this position, it could move toward an agreement to reestablish civil aviation ties to Taiwan, a move which seems certain to antagonize the PRC leadership. In general, any initiative by the Japanese Government that might be construed as supportive of Nationalist Chinese sovereignty will have a negative effect on Japanese-PRC commerical relations.

The factional composition of the Japanese Liberal Democratic Party will be a key determinant of foreign policy initiatives toward Taiwan and the PRC. To the extent that the pro-Taiwan forces in the ruling party and in other politically significant groups are successful in improving Japanese-Taiwan political relations, Japan's commercial relations with the PRC might be adversely affected. Thus, despite the rupture of her diplomatic relations with Taiwan, the so-called Taiwan issue will continue to affect Japan's relations with Peking.

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CHINA'S FOREIGN TRADE, 1950–74*

By NAI-RUENN CHEN

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TABLES

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I. INTRODUCTION

In quantitative terms the People's Republic of China (PRC), despite its large size, is not a major trading nation. Chinese exports never exceeded 2 percent of world exports. The ratio of total trade to China's gross national product is about 5 to 6 percent. In terms of trade per head of population, the value for China is some $14, one of the lowest in the world for any major nation. In spite of the smallness of its value, foreign trade is an important policy instrument used by the PRC for the pursuit of her overall political and economic goals. Being a state monopoly within the Chinese command economy, foreign trade has become a significant ingredient in China's development program to transform itself into a modern industrial state. Specifically, foreign trade in China has played the following roles.

Foreign trade has constituted for China an important means of facilitating and accelerating modernization. China does not have all the facilities to produce the wide variety of machinery and equipment needed for modernization. Some industrial materials were either not available in China, or available only in insufficient quantities. Foreign trade helps provide the necessary capital goods. Imports of these

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goods, moreover, have given China an important channel of access to modern technological know-how. The importation of specialized machineries and complete plants, some of them installed by foreign technicians, accelerate the process of technological diffusion.

Foreign trade has also provided a means of compensating for shortfalls in domestic production. The importation of agricultural products from the West since 1961 is a case in point. In addition to economic considerations, the conduct of foreign trade in the PRC has been influenced by political and ideological factors.[1] Many examples can be cited, the most notable one being the "lean-to-one-side" policy of the 1950's and the subsequent decline of Chinese trade with the Soviet Union and Eastern Europe following the Sino-Soviet rift.

This paper presents a general survey of the trend, commodity composition, and direction of PRC foreign trade in the past quarter century with an emphasis on recent years. One major development in recent PRC trade has been the resumption of commercial relations with the United States in 1971 and a rapid expansion of bilateral trade in subsequent years. United States-PRC trade, therefore, will be treated in some length. Finally, the prospect for the expansion of PRC trade in general, and with the United States in particular, will be discussed through an examination of PRC economic and trade policies and its specific policy toward imported technology and equipment.

II. Trends in PRC Foreign Trade

Foreign trade data from Chinese sources are scanty. Only a small number of figures of an aggregate nature were published in the 1950's, and a few more, mostly percentages, in the early 1970's. Estimates of PRC foreign trade, therefore, will have to be made from its trading partners' statistics. Several estimates are available.[2] This paper is based on a U.S. government estimate; its earlier series appeared in two previous volumes on the PRC economy submitted to the Joint Economic Committee in 1967 and 1972, respectively.[3]

This estimate, like other independent estimates, provides data only in current dollars. Since these data include price fluctuations, they do not reflect truly trends and changes in commodity composition and geographic direction. The problem becomes especially serious for the data estimated for the early 1970's due to revaluation of world currencies and worldwide inflation. Without appropriate adjustments the data would overstate greatly the year-to-year growth since 1970. It would be ideal if the whole analysis could be based on detailed data

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[1] Chinese economic planners in making a decision must consider not only both immediate and long-term economic advantages to be derived from it, but also its political and ideological impacts. In dealing with trade matters, however, they tend to become flexible and pragmatic. In some cases where economic advantages are of overriding importance, political and ideological considerations are waived and the Chinese show no hesitation in coming to terms with realities.

[2] See Robert F. Dernberger, "Prospects for Trade between China and the United States," in Alexander Eckstein (ed.), *China Trade Prospects and U.S. Policy*, New York: Praeger Publishers, 1971; Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade*, New York: McGraw-Hill Book Co., 1966; and Feng-hwa Mah, *The Foreign Trade of Mainland China*, Chicago and New York: Aldine-Atherton, 1971. There are discrepancies among various independent estimates stemming from differences in sources, in coverage and in handling of such problems as double counting, valuation, currency conversion ratios, and c.i.f. adjustments.

[3] Robert L. Price, "International Trade of Communist China, 1950–65," in U.S. Joint Economic Committee, *An Economic Profile of Mainland China*, Washington, D.C.: U.S. Government Printing Office, 1967; and A. H. Usack and R. E. Batsavage, "The International Trade of the People's Republic of China," in U.S. Joint Economic Committee, *People's Republic of China: An Economic Assessment*, Washington, D.C.: U.S. Government Printing Office, 1972.

valued in constant prices. In the absence of su h data, we use mainly the deflator series estimated by Alexander Eckstein to derive total export and import series in constant prices to show trends in real tems while data on commodity and country breakdowns remain to be expressed in current dollars.[4]

Data on total turnover, exports, and imports for 1950 to 1974, valued in both current and constant dollars, are provided in appendix table A.1.

Chinese economic development since the founding of the People's Republic has been characterized by fluctuations in domestic economic activity.[5] These fluctuations were in general reflected in the foreign trade sector.[6] In dollar terms, trade expanded steadily from 1950 through 1959 except for 1952 and 1957, in which volume fell slightly mainly due to a decline in imports. The "Five Antis" campaign, which interrupted economic recovery, and the Western embargo on strategic materials may have accounted for the decline in 1952. Overinvestment in 1956 and shortages of agricultural products were probably the most important causes of import curtailment in 1957.

In 1958, the year of the Great Leap Forward, the volume of foreign trade rose sharply. This reflected a large increase in import demand for capital goods to support the Great Leap programs and a substantial rise in agricultural output, thus permitting exportation of more

[4] The use of current-value data has less serious effects on changes in the commodity composition and geographic direction, both of which are shown in terms of percentage distribution, than on year-to-year increases in trade totals. Take the share of machinery and equipment in total imports in recent years as an illustration. The following table shows the real value in terms of 1957 dollars as a percentage of the current value for total imports and for machinery and equipment imports during 1969–73. The magnitudes of the effect of price changes on both are not appreciably different for 1969 through 1972. For these years, therefore, the use of current-value data does not appear to alter significantly the true share of machinery and equipment in total imports by the PRC. For 1973, however, the effect of inflation and currency revaluations appears to have been significantly greater on total imports than on machinery and equipment imports. The share computed from the current-value data tends to understate the relative importance of machinery and equipment in total imports in 1973, and overstate that of those commodities, the prices of which went up more than the average in that year.

THE RATIO OF IMPORTS IN 1957 PRICES TO IMPORTS IN CURRENT PRICES IN THE PRC, 1969-73

[In percent]

Year	Total imports	Machinery and equipment imports
1969	96	93
1970	88	89
1971	85	87
1972	78	82
1973	58	72

NOTES AND SOURCES

Total imports—Appendix table A.1. Total imports in 1963 prices were converted to those in 1957 prices on the basis of Eckstein's import deflator series.

Machinery and equipment imports—Central Intelligence Agency, "People's Republic of China: Foreign Trade in Machinery and Transportation Equipment Since 1952," Washington, D.C., January 1975.

[5] For a discussion of changes in the level of domestic economic activity, see Arthur G. Ashbrook, Jr., "China: Economic Policy and Economic Results, 1949–71," in U.S. Joint Economic Committee, *People's Republic of China: An Economic Assessment*, 1972, pp. 3–51; and "China: Economic Overview, 1975," in this volume.

[6] For a discussion of the close relationship between trends in China's foreign trade and the levels of its domestic output, see Alexander Eckstein, "China's Economic Growth and Foreign Trade," *United States-China Business Review*, vol. 1, No. 4, July–August 1974, pp. 15–20.

agricultural commodities. Trade volume reached a peak in 1959. Between 1952 and 1959, real trade volume rose at an average annual rate of 13.6 percent, outpacing the growth rate of gross national product.[7]

During the period 1960–62, the foreign trade data show a declining trend, reflecting the economic crisis which followed the Great Leap and the deterioration of Sino-Soviet relations. By 1962 trade volume appears to have declined to less than two-thirds of the 1959 peak level. Post-Leap economic recovery was accompanied by a gradual revival of foreign trade during 1963–66. However, 1966 trade volume was still below the previous peak.

Foreign trade declined again though mildly in 1967 and 1968 under the impact of the Cultural Revolution. In these years the fall in industrial production, delays in transport, purges of those officials in charge of central economic planning and foreign trade, and Red Guard rampages against foreign embassies affected trade adversely. When the economy began to recover with the conclusion of the Cultural Revolution in the latter half of 1969, both exports and imports in dollar terms began to turn back upward while real imports continued to decline. Between 1959 and 1969, the combined volume of exports and imports declined by 10 percent in dollar value and 18 percent in real value in contrast to a rise in gross national product.[8]

Trends in PRC foreign trade since 1970 seem to have been more of a continuation from those of the 1950's than from those of the 1960's. Both exports and imports have risen rapidly following the recovery from the disruptions caused by the Cultural Revolution. Machinery and equipment imports increased markedly in the early 1970's to meet the requirements for industrial expansion called forth in the Fourth Five-Year Plan (1971–75). Substantial increase in agricultural purchases also contributed to a rise in total imports in 1972 and 1973. Foreign trade was facilitated by China's more open posture toward the West following the ping pong diplomacy in the spring of 1971. Between 1970 and 1973 total trade once again rose faster than gross national product.[9] Trade turnover in 1974 grew 39 percent in dollar value, but only 3 percent in real value. China's export expansion efforts in the past year encountered some difficulties caused by the worldwide recession and, perhaps to a lesser extent, by congestion in Chinese ports which led to delays in exports. At the same time, China's capacity to import large quantities of agricultural products and of machinery and equipment may have reached a plateau in 1974 since these massive imports, coupled with a slowdown in exports, probably resulted in a foreign exchange shortage. In an effort to reduce trade deficits for 1974, some imports were cut back during the final quarter of the year. Successive good harvests in 1973 and 1974 also permitted China to cancel or delay the importation of certain agricultural products scheduled for 1974.

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[7] Between 1952 and 1959, China's gross national product in real terms rose at an average annual rate of nearly 8 percent according to Eckstein's estimate, or 6.6 percent according to Ashbrook's estimate. (Ibid.; and Ashbrook, *op cit.*)

[8] Between 1959 and 1969, gross national product in constant dollars rose by 40 percent according to Eckstein's estimate, or 20 percent according to Ashbrook's estimate. Eckstein (1974), *op cit*; and Ashbrook (1972), *op cit.*)

[9] Between 1970 and 1973, real trade grew by 53 percent compared to an increase of 21 percent in real gross national product.

III. Commodity Composition of FRC Foreign Trade

The impact of domestic economic development upon the pattern of China's foreign trade becomes more evident when changes in the commodity composition of Chinese imports and exports are examined. The problem has been studied in some detail for the years prior to the mid-1960's by a number of specialists, notably, Eckstein, Dernberger, and Mah.[10] In appendix tables A-2 and A-3, data are provided on the commodity composition of PRC imports and exports, respectively, for 1966 through 1973. These data and the findings for earlier years of other studies serve the basis for the following discussion.

1. Imports

With respect to the commodity composition of Chinese imports, significant shifts took place in five major categories: (a) machinery and equipment; (b) metal and metal products; (c) mineral fuels; (d) chemicals; and (e) foodgrains.

A. MACHINERY AND EQUIPMENT

The process of economic development in the PRC is clearly reflected in imports of machinery and equipment, which depend mainly on the level of domestic investment. In the early 1930's during which the ratio of gross investment to gross domestic product in China was 7.5 percent,[11] machinery and equipment imports accounted for only 5 to 7 percent of total imports.[12] During the industrialization drive of the mid-1950's in which the ratio of gross capital formation to gross domestic product amounted to 24 percent,[13] the share of machinery and equipment in total imports became 20 percent in 1952, and rose to over 40 percent in 1957.[14] The share reached a peak of nearly 48 percent in 1959 as the Great Leap programs led to a marked acceleration of investment in fixed capital.[15]

With the collapse of the Great Leap movement and the abrupt ending of Soviet economic assistance, imports of machinery and equipment dwindled to a low of about 10 percent of total imports in 1962.[16] The share recovered gradually to 22 percent in 1966 owing to a steady recovery in investment and in the levels of economic activity as a whole. Thereafter, the share again declined for 3 successive years to 13 percent in 1969 as a consequence of the Cultural Revolution, to recover to an average of close to 20 percent in the early 1970's.

In the last few years imports of machinery and equipment rose substantially. In dollar terms, they amounted to $855 million in 1973 and reached $1.7 billion in 1974, exceeding the 1959 peak level of $980 million by a considerable margin. In real terms, however, 1974 imports

[10] For their estimates of the commodity composition of PRC imports and exports, see Eckstein (1966), *op. cit.*; Dernberger, *op. cit.*; and Mah, *op. cit.*

[11] K. C. Yeh, "Capital Formation," in Alexander Eckstein, Ta-Chung Liu, and Walter Galenson (eds.) *Economic Trends in Communist China*, Chicago: Aldine Publishing Co., 1968, p. 511.

[12] Calculated from the data given in Dernberger, *op. cit.*, p. 213.

[13] K. C. Yeh, *op. cit.*

[14] Central Intelligence Agency, *People's Republic of China: Foreign Trade in Machinery and Transport Equipment Since 1952*, Washington, D.C., January 1975.

[15] Robert L. Price, *op. cit.*, p. 586.

[16] Ibid.

may not have been substantially higher than the level attained in 1959.[17]

Apart from large fluctuations in their relative share in total imports, China's machinery and equipment imports also underwent significant changes in their specific composition. Complete plants constituted 46 percent of total imports of machinery and equipment during 1953–58, rose to 62 percent during 1959–62, and then gradually dropped to insignificant percentages in the latter half of the 1960's.[18] The Soviet Union was the main source of complete plants imports by the PRC prior to 1962. But since then the West has become the sole supplier. The acquisition of complete plants has stepped up sharply since 1972. During 1973–74, contracts worth over $2 billion were signed by the PRC.[19] These plants were for a few basic industries such as petrochemical, fertilizer, iron and steel, and electric power.

Another significant change in the structure of machinery and equipment imports was a rise in the relative importance of transport equipment in recent years. The share of transport equipment in machinery and equipment imports averaged between 20 to 30 percent for the 1950's and the 1960's being somewhat larger in the latter than in the former, rose to 45 percent during 1970–72, and reached over 50 percent in 1973. Recent transport equipment imports have centered on aircraft, heavy trucks, railway vehicles, and ocean freighters.

B. METALS AND METAL PRODUCTS

China's imports of metal and metal products, like her imports of machinery and equipment, are closely related to the pace of industrial growth. China is well endowed with mineral resources, and has expanded considerably ferrous and nonferrous metal production. But domestic output was not sufficient to meet the needs of rapid industrialization, and some imports, particularly of steel, copper, nickel, and lead, were necessary. Except for 1958, metals and metal manufactures accounted for about 10 percent of the import bill in the 1950's and the early 1960's.[20] The share began to rise in the mid-1960's, and has remained at the 25–27 percent levels since 1969. The increase was partly due to large imports of iron and steel, high-quality and specialty steel in particular, for the new construction programs called forth in the Fourth Five-Year Plan.

C. MINERAL FUELS

One striking shift in the commodity composition of Chinese foreign trade is the virtual disappearance of mineral fuels from the import bill. The import share of crude oil and petroleum products was about 10 percent in the 1950's, and dwindled to 4 percent in 1964 and to a trifling 0.1 percent in 1967.[21] At present China has achieved self-

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[17] 1973 imports of machinery and equipment, in 1957 prices, were some 62 percent of the 1959 level. See CIA, *Foreign Trade in Machinery and Equipment Since 1952*, *op. cit.*, table 3.

[18] Dernberger, *op. cit.*, pp. 310–311, table A7.

[19] This figure is based on incomplete data on major contracts by the PRC. The widely used term "complete plants" is somewhat misleading. The PRC has purchased some complete plants, numerous major additions to existing plants, and various units of equipment, some of which, such as turbogenerators, cost more than some of the so-called complete plants. Technology sales have been included in some of these purchases.

[20] Dernberger, *op. cit.*

[21] Ibid.

sufficiency in petroleum with some surplus for exports chiefly because of the discovery and exploitation of rich oil deposits. The shift for China from an importer to an exporter of crude oil is a dramatic example of how quickly comparative advantage can be changed by accidents or technological breakthrough.

D. CHEMICALS

Another feature in a changing commodity composition of Chinese imports was the shift in the relative weight of chemicals as evidenced by the rise in their import share from an average of 8 percent during 1953–62,[22] to 17 percent in the late 1960's and about 14 percent in 1970–72. In monetary terms the share declined to 9 percent in 1973, and in real terms it may have been even lower due to relatively larger increases in the prices of chemical imports. The share probably declined further in 1974 in both monetary and real terms as rising prices and foreign exchange constraints caused China to cut back imports and delay shipments. Fertilizers have been the most important component of chemical imports, constituting one-half of the total in 1972 and 1973, and about two-thirds in pre ous years.

The rise in the relative importance of chemical fertilizers in Chinese imports during the 1960's reflected the adoption of the development strategy of according agriculture the highest priority. After the Great Leap fiasco it became apparent to the Chinese planners that sustained growth of farm output could not be obtained without substantial increases in the use of chemical fertilizers. Since then the Chinese government has made strenuous efforts to expand fertilizer supplies, and the chemical fertilizer industry has received a top priority in investment allocation. As a result, total output rose from 2 to 3 million tons a year in the early 1960's to 14 million tons in 1970 and 25 million tons in 1974.[23]

Despite its rapid growth, the domestic output of chemical fertilizers was far from sufficient to meet the requirements for raising agricultural production to desirable levels. Thus China had to turn to the world market for supplies. In 1952 China imported 239,000 tons of chemical fertilizers; in 1957, nearly 1 million tons. During 1967–74 Chinese imports rose to over 4 million tons each year.[24] But the relative share of chemical fertilizers imports in the total supply (production and imports combined) has declined from about one-half in the 1950's to about 30 percent in the 1960's and less than 20 percent in 1973–74.

The Chinese Government probably has embarked upon a major program to step up the domestic production of chemical fertilizers. Since 1972 China has contracted with foreign firms to purchase 26 chemical fertilizer plants with annual productive capacities of 330,000 to 574,000 tons. By 1980 these plants could turn out some 10 million tons of chemical fertilizers. At the same time, a large number of small chemical fertilizer plants have been established largely with local resources throughout the countryside, and the relative contribution of small plants to the total output has increased considerably.[25]

[22] Ibid.
[23] "Economic Indicators for China," *United States-China Business Review*, vol. 2, No. 3, May-June 1975, p. 15.
[24] Ibid.
[25] For example, the number of small nitrogenous fertilizer plants reportedly increased from 90 in 1965 to 1,000 in 1973. These plants accounted for only 12 percent of the total output of nitrogenous fertilizer in 1965, but 33 percent in 1968, and 54 percent in 1973. (*Peking Review*, Dec. 8, 1972; Dec. 15, 1972; Jan. 19, 1973; and Jan. 18, 1974).

The rapid expansion of modern fertilizer plants, coupled with substantial increases in small plants throughout the countryside, appears to represent a grand design to reduce China's dependency on imported fertilizers. But at the present time the rate of fertilizer use in mainland China is still far below that in some of its neighboring areas in Asia. In the foreseeable future China can be expected to continue importing chemical fertilizers, although their relative importance in Chinese import structure will, in all probability, decline gradually.

E. FOODSTUFFS

One dramatic change in the commodity structure of China's imports was the sharp rise in the share of foodstuffs to 21 percent in 1961 from less than 2 percent in the preceding years.[26] This reflected the serious magnitude of the agricultural crisis at that time. The import share of foodstuffs rose to 25–26 percent in 1962–64, remained at the 13–17 percent level in 1965–72, and rose again to around 20 percent in 1973–74.

Data on the ton and dollar figures of China's grain imports during 1961–74 are provided in appendix table A.4. During 1961–66 China imported each year 5 to 6 million metric tons of grains, mainly wheat, costing about $400 million. Grain imports remained relatively undiminished at an annual level of about 4 million metric tons, or $200 to $300 million during 1967–71. Imports rose slightly in 1972, but sharply in 1973 to a level of 7.7 million metric tons with a cost of $840 million. The quantity of grain imports for 1974 was somewhat below the 1973 level, but rising prices pushed the total cost higher.

Several explanations have been advanced as to why China has continued to import wheat despite agricultural improvements in recent years. Enlargement of grain reserve, alleviation of the burden on the domestic transport system to ship grain to the coastal, food-deficit areas from inland producing regions, and achievement of "comparative advantage" by importing wheat and exporting rice and soybeans are among the reasons frequently mentioned. The official reason most recently stated is "to vary the diet," [27] or "to change some food varieties." [28] Whatever the rationale, it seems probable that China will continue to import wheat and other farm products. Poor harvests in 1972 led to substantial food imports in 1973 and 1974; and farm improvements in these 2 years were at least partly responsible for recent cancellations and delays of foreign grain deliveries. In the future, therefore, the level of Chinese agricultural imports will most likely depend on the harvest conditions more than any other factor.

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[26] Dernberger, *op. cit.*

[27] Li Chiang (Minister of Foreign Trade), "New Developments in China's Foreign Trade," *China's Foreign Trade*, No. 1, 1974, pp. 1–5; quotation on p. 2.

[28] Hao Chung-shih, head of the Chinese delegation to the United Nations Food Conference and vice minister of agriculture and forestry, stated at the plenary meeting in Rome in November 1974: "China has also imported some food-grains from the world market, but China does not rely on imports for feeding her population. The main purpose of our imports is to change some food varieties." (*Peking Review*, No. 46, Nov. 15, 1974; quotation on p. 12). Wang Yao-ting, Chairman of the China Council for the Promotion of International Trade, also stated in a recent article, "China has imported some wheat and oilseeds while exporting a certain amount of rice, miscellaneous cereals and oilseeds. The aim is mainly to adjust the varieties of crops and supply the needs of importers and exporters." (*Peking Review*, No. 41, Oct. 11, 1974; quotation on p. 19).

2. *Exports*

The commodity composition of China's exports has exhibited more stability than that of its imports. Prior to the founding of the People's Republic, some 75 percent of Chinese exports were agricultural in nature, with oilseeds (particularly soybeans and soybean products) heading the list, followed by textile fibers, tung oil, eggs and egg products, tea, and tobacco. Other major export commodities included nonferrous metals, pig iron, coal, and a wide variety of handicraft products. This pattern of export trade continued after 1949 for some years, and thereafter underwent some gradual changes.

A. FOODSTUFFS

Foodstuffs were the most important category in the early 1950's, accounting for nearly one-half of China's total exports. The relative weight of foodstuffs declined gradually to about one-third of total exports in the late 1950's, reflecting industrial development in China. The agricultural crisis of 1959–61 disrupted the trade pattern, with a significant decline in total exports and in the export share of both foodstuffs and other farm products. In 1961 when the crisis reached its heights, the export share of foodstuffs plunged into the 13-percent level.[29] As the economy gradually recovered from the agricultural crisis, China's export structure returned to a more normal pattern. From 1966 to 1974 foodstuffs accounted for, on the average, 30 percent of total exports.

Rice appears to have become an increasingly important item of China's foodstuffs exports. The PRC has exported rice each year since 1950.[30] In the early 1960's a former official of the Ministry of Foreign Trade advanced the argument that by exporting rice and importing wheat China could earn more foreign exchange.[31] The argument did not appear to be convincing for the 1960's because China's rice-wheat trade in that period did not result in net foreign exchange earnings. On the contrary, the trade necessitated an annual net outpayment of $200 to $300 million during 1960–67 and $130–$150 million in 1968–69.[32] In recent years, however, China may have approached a balance in its rice-wheat trade. Speaking at the United Nations World Food Conference in November 1974, China's Vice Minister of Agriculture and Forestry Hao Chung-shih stated:

> In about 3 years from 1972 up to now, we have imported over 2 billion U.S. dollars worth of grain, mainly wheat. In the same period, we have exported grain, mainly rice, valued at the same total amount. Therefore, China's imports and exports in the past 3 years strike a rough balance in value.[33]

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[29] Dernberger, *op. cit.*, pp. 308–309, table A.6.

[30] U.S. Department of Agriculture, Economic Research Service, *Agricultural Trade of the People's Republic of China, 1935–69*, Foreign Agricultural Economic Report No. 83, Washington, D.C., August 1972, p. 33.

[31] Dick Wilson, "Interview with Cheng Ming," *Far Eastern Economic Review*, May 21, 1964.

[32] The figures for 1960–67 are based on Mah's estimate (F. H. Mah, *The Foreign Trade of Mainland China*, p. 32). The figures for 1968–69 were derived from the data on China's grain imports shown in appendix table A.4, and the data on China's rice exports are provided in U.S. Department of Agriculture, Economic Research Service, *op. cit.*

[33] *Peking Review*, Nov. 15, 1974; quotation on p. 12.

Hoa's statement seems to be consistent with other available data.[34]

But even if China's grain trade has become in balance, the amount of foreign exchange earnings from grain exports still is not sufficient to meet payments for grain imports mainly because a substantial portion of Chinese rice exports represents aid to certain countries.[35] If grain prices on the world market remain high, and if the ratio of prices between rice and wheat continues to be in favor of the former, rice could become an attractive earner of foreign exchange. The Chinese press claims that China has become a major rice exporting country, and that over 60 countries throughout the five continents are now buying Chinese rice.[36] In the future China can be expected to continue exporting rice, and the relative importance of rice in China's export structure could increase especially in years of good harvests.

B. CRUDE MATERIALS, FUELS, AND EDIBLE OILS

Included in this category were a number of China's traditional export commodities such as bristles, hides and skins, oilseeds, tung oil, tea, raw silk, wool, and certain crude minerals. The export share of this categody showed in general greater stability than that of foodstuffs. Products of agricultural origin, however, fluctuated more widely than those of animal and mineral origin.

The relative weight of this export category will likely increase substantially in the years to come because of China's oil export potential. We have already alluded to the fact that China has become basically self-sufficient in petroleum.[37] One million tons of Chinese crude oil were exported to Japan for the first time in 1973, and 4 million tons in 1974. China also has begun to export crude oil to the Philippines, and small quantities of diesel oil and kerosene to Hong Kong and Thailand. Some other Pacific Basin countries, including Australia and New Zeland, are reportedly exploring the possibilities of buying Chinese oil products.

The Chinese Government has given the petroleum industry a high priority in the allocation of its limited investment resources. Crude oil production will in all probability continue to grow at a rapid rate, and a significant portion of it is expected to be exported. Increasing oil exports will provide China with a greater possibility of further expanding its foreign trade,[38] and should have significant impact on the commodity structure of Chinese exports.

C. CHEMICALS

Chemical products as a category have never been of major importance in China's export trade. Their share, however, gradually

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[34] China imported nearly 20 million tons of grains costing about $2.3 billion during 1972–74. (See appendix table A.4. It claimed to have exported 3 million tons of rice in 1972. (*Peking Review*, Jan. 5, 1973). Preliminary estimates suggest that Chinese rice exports during 1973–74 probably amounted to 2.5 million tons. Total rice exports during 1972–74 valued at prevailing world market prices were close to $2 billion. This figure plus the value of other grain exports during 1972–74 would add up to an amount in rough balance with China's grain imports in the same period.

[35] *Peking Review*, Nov. 15, 1974, p. 12.

[36] *Ta-kung Pao*, Oct. 27, 1974, p. 1.

[37] In the early 1950's the annual output of crude oil in China was no more than 1 million metric tons. The output rose to some 11 million metric tons in 1965, over 28 million metric tons in 1970, and 65 million metric tons in 1974. (See K. C. Yeh, *Communist China's Petroleum Situation*, Santa Monica, Calif.: The Rand Corp., 1962, p. 5; and *United States-China Business Review*, May-June 1975, p. 15.)

[38] This appears to be also the opinion of Wang Yao-ting, Chairman of the China Council for the Promotion of International Trade. (*Peking Review*, Oct. 11, 1974).

rose from 2 to 3 percent in the 1950's, to 3 to 4 percent in the 1960's, and over 5 percent in recent years.[39] Major export commodities included fireworks, gelatins, cosmetics, soaps, drugs, and wood and resin-based chemical products. China claims that chemicals, like a number of manufactured articles, enjoys a ready sale in many countries.[40]

D. MANUFACTURES

A significant shift in the commodity composition of Chinese exports is represented by a gradual increase in the relative share of certain manufactured goods, such as textile products. Textiles (not including raw fibers) rose from less than 4 percent of Chinese exports in 1953 to 16 percent in 1957 and 19 percent in 1958. The share increased sharply in 1959 to nearly 28 percent, reached 32.5 percent in 1960, and averaged 40 percent in 1961–63.[41] These substantial increases were achieved at the expense of farm exports which exhibited both an absolute and relative decline. In those years of agricultural crisis, textiles replaced foodstuffs as the leading export. This does not mean that there had been a significant expansion of textile output. On the contrary, the decline in cotton production in the early 1960's resulted in a curtailment of the supply of raw materials, forcing textile plants to operate below capacity. The increase in textile exports during 1960–63 must have been accompanied by a reduction in domestic textile consumption. With the improvement of the agricultural situation, foodstuffs have regained since 1964 the leading role in China's export trade. From 1966 to 1973 the export share of textile stabilized at a level between 22 and 25 percent.

In recent years there was an upward trend in the export share of certain other light manufactures. Increasingly large quantities of China-made bicycles, sewing machines, cameras, radios, watches, and a wide variety of other manufactured consumer goods were sold to foreign countries.

Nonferrous metals and metal products, which were also China's traditional export commodities, averaged about 7 percent of total exports in the 1950's and the early 1960's.[42] The export share declined in the latter half of the 1960's, and remained at a level of 3 to 4 percent in the early 1970's.

China began to export, in some significant quantities, machinery and equipment in 1954.[43] Since then their export share has fluctuated between 2 and 5 percent. During the 1950's nearly all of these exports were directed to North Vietnam, North Korea, and Mongolia. In the early 1960's Albania and Cuba also joined the ranks. Since 1965 increasing quantities of Chinese machinery and equipment also have been exported to the Third World. The bulk of China's machinery exports to the Communist and Third World countries has been provided under aid agreements. Included in these exports have been complete plants, machine tools, textile machinery, agricultural machinery, construction equipment, trucks, and other transport equipment.

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[39] Dernberger, *op. cit.*
[40] Wang Yao-ting, "China's Foreign Trade," *Peking Review*, Oct. 11, 1974.
[41] Dernberger, *op. cit.*
[42] Ibid.
[43] For detailed data on China's machinery and equipment exports, see CIA, *Foreign Trade in Machinery and Equipment Since 1952, op. cit.*

IV. Direction of PRC Foreign Trade

Shifts in the commodity composition of Chinese imports and exports were accompanied by shifts in the geographical and political direction of trade. In prewar years China's main trading partners were Japan, Hong Kong, the United States, and the United Kingdom. These four together made up about 70 percent of China's total trade in the late 1920's, while its trade with the Soviet Union accounted for only 3 to 6 percent of the total.[44] After the People's Republic was founded in 1949, the geographic distribution of China's foreign trade was quickly altered.

1. PRC Trade With Other Socialist Countries

U.S.S.R.

In the 1950's China's trade was reoriented toward other socialist countries, particularly the Soviet Union. Data on PRC trade with other socialist countries are provided in appendix table A.5. Total turnover of trade between China and the Soviet Union increased more than fivefold from $320 million in 1950 to a peak volume of more than $2 billion in 1959. Trade between the two countries accounted for more than one-half of China's total trade during 1952–55, and over 40 percent during 1956–60. From 1951 to 1955 China had a sizable import surplus financed partly by Soviet credits. During the second half of the 1950's, China's exports to the Soviet Union expanded much more rapidly than its imports resulting in an export surplus which was used to amortize Soviet loans.

Sino-Soviet trade began to decline in 1960. Even in 1961–62 when relations between the two countries deteriorated gradually, China's trade with the Soviet Union was still larger than with all other socialist countries combined. Trade dropped to $540 million in 1964, only one-quarter of the peak volume attained in 1959. In the bilateral trade during 1961–64 China maintained an export surplus of some $872 million, which was applied to repay Soviet loans ahead of schedule. Both the absolute value and the relative share of Sino–Soviet trade continued to decline in the second half of the 1960's. Trade reached a low of $45 million in 1970, about 2 percent of the 1959 peak level, accounting for only 1 percent of China's total trade or less than 6 percent of its trade with other socialist countries.

Sino-Soviet trade began to recover in 1971. The Soviet Union was China's fifth largest trading partner in 1972, eighth in 1973, and tenth in 1974. In these 3 years the Soviet share in China's total trade turnover remained low, being 4.3 percent, 2.7 percent, and 2 percent, respectively.

China exported mainly agricultural commodities, metallic ores, nonferrous metals, and textiles in exchange for Soviet capital goods. In the 1950's foodstuffs were China's leading export and machinery and equipment, including complete plants, petroleum products and ferrous metals were major imports from the Soviet Union. Since the early 1960's textile products have gradually replaced foodstuffs as China's leading export to the Soviet Union, while machinery and equipment,

[44] F. H. Mah, *op. cit.*, p. 19.

particularly transport equipment, have dominated Soviet exports to China.

EASTERN EUROPE

China's trade with East European countries, with the exception of Albania and Yugoslavia, generally followed the pattern of Sino-Soviet trade. Albania represents a special case in Sino-East European trade relations. Since 1960 when Albania sided with China in the Sino-Soviet dispute, trade between the two countries has risen from a few million dollars a year in the 1950's to an annual average of $125 million in recent years. On the other hand, Sino-Yugoslav trade declined to insignificant levels in the 1960's due to worsening relations between the two countries. Their relations have improved since 1969,[45] and bilateral trade rose from less than $2 million a year during most of the 1960's to $139 million in 1974.

Prior to the Sino-Soviet split, Czechoslovakia and East Germany were China's largest trading partners in Eastern Europe. In recent years, however, Romania has become China's leading partner in its trade with East European countries. Since 1970 Romania has accounted for about 3 percent of China's total trade, and has been among China's 12 largest trading partners. In general, China purchased mainly machinery and equipment from Eastern Europe, and exported in return foodstuffs, raw materials of agricultural and mineral origin, and light manufactures.

OTHER SOCIALIST COUNTRIES

Trade between China and Cuba began with a volume of $42 million in 1960 and, following the establishment of formal trade relations between the two countries, rose to a record volume of $223 million in 1965. Sino-Cuban trade declined gradually in the second half of the 1960's, and steadied at an annual level of $120–$130 million. Trade involved mainly the the exchange of Cuban sugar and nickel for Chinese rice, textiles, and certain other manufactures.

China's trade with North Korea, North Vietnam, and Mongolia began from $5 million in 1950, accounting for 0.4 percent of its total trade or 1.4 percent of its trade with the socialist world, to an estimate of $262 million in 1962 when for the first time it exceeded Chinese trade with Eastern Europe. Trade began to decline in the mid-1960's; with Mongolia because of political disagreement between the two countries, and with North Korea partly because of the completion of drawings from Chinese credits granted in 1960. On the other hand, trade with North Vietnam continued to expand, reflecting increases in Chinese aid. Sino-Mongolian trade amounted to about $2 million annually in the last several years. China's trade with North Korea and North Vietnam fluctuated between $190 and $260 million during 1965–72, and rose in 1973 to $480 million, accounting for about 5 percent of its total trade and 28 percent of its trade with the Socialist world.[46] In 1974, China's trade with other Asian Socialist countries may have reached $735 million.

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[45] In 1969 China and Yugoslavia signed a trade and payments agreement providing for payment in convertible accounts, a concession which China granted to a socialist country for the first time. (*Current Scene*, vol. X, No. 11, November 1972).

[46] Central Intelligence Agency. *People's Republic of China: International Trade Handbook*, Washington, D.C., December 1972 and September 1974.

2. PRC Trade with Non-Socialist Countries

As indicated above, the bulk of China's trade prior to the establishment of the People's Republic was with the West. Sino-West trade reduced sharply in the 1950's as China directed its trade mainly toward the Socialist world. Since the early 1960's, however, Chinese trade has been reoriented toward the non-Socialist countries. Data on PRC trade with these countries during 1950–74 are provided in appendix table A. 6.

TABLE 1.—PRC TRADE WITH MAJOR PARTNERS, SELECTED YEARS [1]

[Dollar amounts in millions of U.S. dollars]

Country	1959		1961		1966		1970		1973		1974 [2]	
	Trade	Share of PRC trade (percent)	Trade	Share of PRC trade (percent)	Trade	Share of PRC trade (percent)	Trade	Share of PRC trade (percent)	Trade	Share of PRC trade (percent)	Trade	Share of PRC trade (percent)
Japan	$23	0.5	$46	1.5	$631	14.9	$855	19.9	$2,021	20.5	$3,330	24.3
United States									876	8.9	1,082	7.9
Hong Kong	140	3.3	116	3.8	380	9.0	354	8.3	796	8.1	890	6.5
West Germany	195	4.5	81	2.7	217	5.1	270	6.3	487	4.9	650	4.7
Malaysia/Singapore	90	2.1	63	2.1	145	3.4	190	4.4	460	4.7	(3)	(3)
Canada	7	.2	153	5.1	215	5.1	176	4.1	409	4.1	575	4.2
United Kingdom	124	2.9	125	4.1	178	4.2	212	4.9	340	3.4	329	2.4
USSR	2,055	47.9	915	30.3	320	7.5	45	1.0	270	2.7	280	2.0
Romania	59	1.4	29	1.0	66	1.6	108	2.5	265	2.7	(3)	(3)
Australia	38	.9	199	6.6	121	2.9	175	4.1	247	2.5	500	3.7
France	56	1.3	54	1.8	159	3.7	154	3.6	231	2.3	348	2.5
Italy	49	1.1	48	1.6	113	2.7	132	3.1	196	2.0	223	1.6
Total of above	2,836	66.1	1,829	60.6	2,545	60.0	2,671	62.3	6,598	66.8	(3)	(3)
PRC Total Trade	4,290	100.0	3,020	100.0	4,245	100.0	4290	100.0	9,870	100.0	13,715	100.0

[1] Data on trade refer to the combined volume of PRC exports to and imports from various countries.
[2] Preliminary.
[3] Not available.

Sources: Appendix tables A.1, A.5, and A.6.

Among China's 12 leading trading partners in recent years, 10 were from the West. This can be seen from table 1 which lists China's major trading partners in 1961, 1966, 1970, 1973, and 1974. For the purpose of comparison, the table also shows China's trade with these countries in 1959, the peak year before its trade reorientation. The share of the Soviet Union in Chinese trade was 48 percent in 1959, but has not exceeded 4 percent since 1967. In contrast, some of the Western countries such as Japan, the United States, Canada, and Australia, whose trade with the PRC was small or nonexistent in 1959, have now become China's major trading partners.

JAPAN

Japan, which was China's most important trading partner before the Sino-Japanese War of 1937 but carried less than 1 percent of Chinese trade in 1959, once again has occupied the leading position in China's foreign trade since the mid-1960's. Sino-Japanese trade first began to rise markedly in 1964 when the share of Japan in China's total trade reached 10 percent. Thereafter Japan's share expanded steadily, reaching 20 percent during 1970–73 and 24 percent in 1974. Since 1973 Japan not only has continued to maintain its long-held position as the leading exporter to China, but also has outranked Hong Kong for the first time to become the largest importer of Chinese products.

Before the war, China had deficits in its trade with Japan. From 1950 to 1963, however, China consistently realized an export surplus.[47] In the 14-year period the accumulated surpluses amounted to $256 million. Since 1964 the trend has been reversed with China consistently maintaining a sizable surplus of imports from Japan. From 1964 to 1974 China accumulated a total of about 2 billion U.S. dollars in import surplus in trade with Japan.[48]

The most important category of products which China imported from Japan in recent years was iron and steel. Its import share rose from an average of 20 percent in 1964–65 to 40 to 50 percent during 1968–73.[49] Other major imports were chemical fertilizers and machinery and equipment. In 1973 these three commodity categories (iron and steel, fertilizers, and machinery and equipment) constituted 79 percent of Chinese imports from Japan. Iron and steel imports from Japan rose from $536 million in 1973 to $762 million in 1974. The physical quantities of fertilizer imports from Japan actually declined in 1974 due to the strong international demand for chemical fertilizers as well as the decline in Japan's ability to supply them. At the same time, machinery and equipment imports from Japan rose sharply to $573 million in 1974.[50]

There have been some shifts in the commodity structure of Chinese exports to Japan in recent years. Soybeans, the leading Chinese export to Japan before the war, continued to be important, although their

[47] Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade, op. cit.*, p. 203; and Japan External Trade Organization, *How To Approach the China Market*, New York: John Wiley and Sons, 1972, p. 87.

[48] Ibid.; and CIA, *People's Republic of China: International Trade Handbook*, October 1972 and September 1974.

[49] Ibid.

[50] The share of machinery and equipment in Chinese imports from Japan rose from 15 percent in the first half of 1973 to 26 percent in the same period of 1974. See Japan External Trade Organization, *China Newsletter*, No. 5, October 1974, Tokyo.

relative weight gradually declined after 1969. The export of raw silk to Japan was small in the mid-1960's, and gradually increased thereafter. Raw silk surpassed soybeans in 1971 to become China's leading export to Japan. Other major export included food products, particularly frozen shrimp and fish, fruits, and vegetables. Following the establishment of diplomatic relations between the two countries, Japan stepped up markedly the purchase of certain Chinese commodities which Japan had hitherto imported in insignificant quantities. Included were cotton fabrics, clothing, works of arts, and antiques.

In 1974 the structure of Chinese exports to Japan was significantly altered by large shipments of crude oil. PRC exports to Japan during the first half of 1974 rose by 55 percent over the corresponding period of 1973, but the increase was totally attributable to the increase in crude oil exports. As noted earlier, China exported crude oil to Japan for the first time in 1973, and by 1974 it already became the largest item among Japanese imports from the PRC. (PRC exports of crude oil to Japan in 1974 were valued at $391 million.) The share of crude oil in Chinese exports to Japan rose from 0.4 percent in the first half of 1973 to 21 percent in the same period of 1974.[51] At the same time, silk exports to Japan dropped in 1974, with its export share declining from 24.5 percent in the first 6 months of 1973 to 10.8 percent in the comparable period of 1974.[52] (Chinese silk exports to Japan in 1974 amounted to $93 million.) The decline was due to excessive inventories and slackening demand for silk products in Japan.

HONG KONG

Hong Kong plays a unique role in China's international trade. This tiny British Crown Colony in 1973–74 was China's third trading partner in terms of total trade turnover, and the second largest market for Chinese goods. It is the largest source of China's foreign exchange earnings.[53] These earnings are particularly important to China because of the ready convertibility of the Hong Kong currency.

In the initial years of the People's Republic, China had to rely heavily on Hong Kong agents in the conduct of foreign trade due to lack of knowledge and experience and an inadequate foreign trade network and organization. Moreover, countries which were not willing to be charged with violating the embargoes and controls on direct trade with China imposed by the United Nations during the Korean War sent goods to Hong Kong to be reexported to the mainland. As a result, the balance of trade in 1950 and 1951 was in favor of Hong Kong. In 1952 Chinese imports from Hong Kong dropped sharply. Thereafter these imports declined to a level of $1 to $5 million in the 1960's and showed some small increase in recent years.

In contrast, PRC exports to Hong Kong have expanded greatly in the last 25 years. China has consistently maintained an expanding export surplus since 1952, averaging about $350 million per year for the late 1960's and increasing substantially in the early 1970's. The leading

[51] Ibid.
[52] Ibid.
[53] In addition to the sale of merchandise, the sources of Chinese foreign exchange earnings from Hong Kong included overseas Chinese remittances, water sales to Hong Kong, and other business activities. For a discussion of these activities, see Colina MacDougall Lupton, "Hong Kong's Role in Sino-Western Trade," in Arthur A. Stahnke (ed.), *China's Trade With the West: A Political and Economic Analysis*, New York: Praeger Publishers, 1972, pp. 175–208.

Chinese export category to Hong Kong has always been food, accounting for about one-half of the total. Among individual food groups, live animals led the list followed by fruits and vegetables, meat and meat preparations, fish and fish preparations, cereal and cereal preparations, and dairy products and eggs, in that order. Raw materials and semimanufactures, both of which are essential inputs of Hong Kong industry, constitute about one-fifth of PRC exports to Hong Kong. In recent years China also has exported manufactured consumer goods to Hong Kong in increasingly large quantities, making up approximately 15 percent of the total. The expanded shipments of food, raw materials, and manufactures to Hong Kong resulted partly from the rapid growth of the population in Hong Kong, and partly from the impressive economic progress which Hong Kong has achieved since the early 1950's.

WESTERN EUROPE

China's commerce with Western European countries began to rise after the Korean armistice, and gained momentum after 1955 as these countries gradually relaxed their controls on trade with China. Chinese imports from Western Europe reached a peak in 1958, while its exports continued to expand until 1960. Two-way trade reached an annual average of $630 million during 1958-60, and dropped to $350–$380 million per year during 1961–63, reflecting domestic economic difficulties. Following the post-Leap economic recovery and the intensification of Sino-Soviet rift, trade between China and Western Europe began to revive in the mid-1960's, expanded rapidly thereafter, and amounted to $1,690 million in 1973, and $2,170 million in 1974. Nonetheless, the relative share of Western Europe in Chinese trade declined gradually from about 25 percent in the late 1960's to 17 percent in 1973 and 16 percent in 1974 mainly because of China's resumption of trade with the United States and rapid expansion of commercial relations with Japan.

China maintained small surpluses in trade with Western Europe in the early 1950's, and relatively large deficits in the second half of the 1950's as Chinese imports from that area grew faster than exports. These deficits were converted into surpluses during 1961–64. Since then China has again experienced unfavorable balance of trade owing to increases in capital goods imports from Western Europe.

In the early 1950's Switzerland was the leading exporter to China, followed by West Germany, the United Kingdom, and France, while West Germany was the most important purchaser of Chinese products in Western Europe. From 1955 to 1960 West Germany held first place in both exports to and imports from China. Since 1961 West Germany has continued to be the leading exporter to China from Western Europe while alternating with France and the United Kingdom as the largest market for Chinese products. In the last 15 years four of China's 12 leading trading partners have been in Western Europe: West Germany, the United Kingdom, France, and Italy.

The commodity composition of Chinese imports from Western Europe varied from year to year. In general, these imports consisted of mostly chemicals and manufactures. After Japan, Western Europe was for many years China's second largest supplier of chemical fertilizers. The PRC purchased large quantities of fertilizers from the international consortium NITREX which was composed of nine firms in West Germany, Netherlands, Italy, Belgium, Austria, Norway, and France. Besides fertilizers, China relied on particular countries for certain types of commodities.

West Germany has been China's largest supplier of iron and steel, and together with France, of machinery and equipment in Western Europe. France was the only country in Western Europe from which China purchased grain in the early 1960's.[54] The United Kingdom was a major source of nonferrous metals prior to 1971, but its exports to China declined in recent years as the PRC imported more of these metals from other countries, particularly Canada, Chile, Peru, and Zambia. The United Kingdom also has been a major supplier of aircraft to China. Italy has been an important source to China of chemical products including, in addition to fertilizers, dyestuffs, plastics, and synthetic fibers.

Most of China's exports to Western Europe have been processed and unprocessed foodstuffs and raw materials of agricultural and animal origin, but the relative weight of these commodities appears to have declined gradually in recent years. Exports to West Germany featured fruits and vegetables, textile fibers, leather, and leather products. France was China's major customer for animal, meat, and fish products, and also bought relatively large quantities of Chinese nonferrous metals. The United Kingdom purchased comparatively large amounts of Chinese chemical and textile products. Chinese exports to Italy were mainly silk and silk products as well as animal and meat products.

CANADA AND AUSTRALIA

China's trade with Canada and Australia was very small in the 1950's. Since 1961, however, these two countries have emerged as China's leading grain suppliers. Annual combined shipments have ranged in value from $200 million to $700 million.

At the same time, Chinese exports to these countries were limited, consisting of mainly textiles, other light manufactures, and food products. Consequently, China has maintained annually since 1961 a large trade deficit with Canada, reaching a level of $303 million in 1973. The deficit expanded further in 1974 when China imported 1.9 million metric tons of Canadian wheat at a cost of $400 million. Except for 1971 and 1972 when China imported insignificant quantities of Australian wheat, the balance of trade between China and Australia was in favor of the latter. China's trade deficit with Australia amounted to $75 million in 1973, and rose to $235 million in 1974 when the PRC bought 1.4 million metric tons of Australian wheat valued at $241 million, not including insurance and freight costs.

V. United States-PRC Trade

There was virtually no trade between the United States and the People's Republic of China from 1954 to 1970. When Sino-American relations began to thaw in 1971, $5 million worth of Chinese products were sold to the United States primarily through third countries. Direct trade resumed in 1972, during which year Chinese exports to

[54] From 1961 to 1965 the PRC imported 1.8 million metric tons of grain from France. (Robert L. Price, *op. cit.*, p. 601).

the United States amounted to $32 million while $79 million worth of American products were sold to the PRC. Trade between the two countries rose sharply in 1973. In that year Chinese exports to the United States were valued at $64 million while American sales to China reached $812 million. In 1974 $115 million worth of Chinese products were exported to the United States while PRC imports of American products reached the level of $967 million.[56]

The expansion of United States–PRC trade in the last few years has led many to wonder how fast and to what extent trade between the two countries will continue to grow, and what commodity categories will have best trade potentials. Needless to say, with the present state of art and the limited amount of information available it is not possible to provide answers to these questions with any degree of precision. An attempt is made in this section to derive estimates of United States–PRC trade that would have prevailed in the last few years if trade relations between the two countries were normalized, and to compare actual trade levels with "normalized" levels. It is hoped that through such an exercise we may bring out highlights of United States-PRC trade since its resumption and shed some light on the prospect for future trade between the two countries.[57]

There are several ways to estimate the "normalized" level of United States-PRC trade.[58] The approach adopted here is to derive a set of data based on PRC trade with industrialized Western economies. With this as a basis attempts are made to determine the volume of major commodity categories which might have been traded between the United States and the PRC if trade relations between the two countries were normalized. For our purpose, "normalized" trade relations between the two countries are assumed to be similar to those which already exist between the PRC and other industralized Western economies. In other words, we assume that under normalized conditions the trade between the PRC and the United States would be conducted on the same basis as that between the PRC and other industralized countries in the West, and that any barriers in the former would not differ significantly from those which currently exist in the latter. Given these assumptions we employ a methodology which presumes that the U.S. share in PRC trade with the industralized West would be the same as the U.S. share in the total trade of the industralized West.[59]

1. PRC Exports to the United States

Table 2 presents data on PRC exports to the United States for 1971 through 1974 by commodity category and derived estimates of "normalized" exports for 1971 through 1973. Lack of complete data

[56] As explained in the notes to various tables in appendix A. for the purpose of this paper PRC imports are valued on a c.i.f. basis and PRC exports, on an f.o.b. basis. Data on PRC imports from the United States on an f.o.b basis can be found in "The Sino-American Commercial Relationship" by William Clarke and Martha Avery in this volume.

[57] For a detailed discussion of the United States-PRC commercial relationship, see the paper by Clarke and Avery.

[58] One approach which has been frequently suggested would be to start from the prewar pattern of trade between China and the United States, and then make some assumptions about what might have happened had Sino-American relations been normalized. However, the structure of the Chinese economy and government economic policies in post-1949 China have differed significantly from those of pre-1949 years, resulting in substantial shifts in China's export and import trade structure. Accordingly, the prewar pattern of Sino-American trade might not be a reliable guide to what will probably happen to future trade relations.

[59] The methodology and data used to estimate "normalized" trade between the PRC and the United States are explained in appendix B.

at this writing (February 1975) does not permit us to derive "normalized" estimates for 1974. According to our calculations, PRC exports to the United States amounted to less than 4 percent of the "normalized" level in 1971, and rose to 16 percent in 1972 and 23 percent in 1973.[60] Preliminary data suggest that PRC exports to the United States probably reached 30 percent of the "normalized" level in 1974.

TABLE 2.—NORMALIZED AND ACTUAL PRC EXPORTS TO THE UNITED STATES, 1971–74[1]

[In millions of U.S. dollars and percent]

	1971			1972			1973			1974
	N	A	$\frac{A}{N}$x100	N	A	$\frac{A}{N}$x100	N	A	$\frac{A}{N}$x100	A
Foodstuffs	34.5	1.5	4.3	45.6	4.3	9.4	65.0	6.6	10.2	16.3
Of which:										
Animals, meat and fish	17.8	.1	.6	15.0	1.0	6.7	26.0	1.4	5.4	7.6
Grains	.1	(2)	(2)	.2	(2)	(2)	.2	(2)	(2)	(2)
Fruits and vegetables	8.0	.1	1.3	7.2	1.1	15.3	13.0	1.9	14.6	2.0
Crude materials, fuels and edible oils	40.0	2.2	5.5	55.1	12.3	22.3	79.0	15.8	20.0	16.8
Of which:										
Oilseeds	.1	(2)	(2)	.1	.1	100.0	.6	(2)	(2)	(2)
Textile fibers	4.2	.2	4.8	7.2	4.1	56.9	10.0	6.2	62.0	4.6
Crude animal materials	5.8	2.0	34.5	4.9	7.7	157.1	10.0	7.3	73.0	8.3
Chemicals	5.7	.3	5.3	6.2	2.1	33.9	11.0	8.2	74.5	18.4
Manufactures	46.2	.7	1.5	91.8	13.5	14.7	104.0	32.5	31.3	62.0
Of which:										
Textile yarn and fabric	12.2	.2	1.6	19.6	3.3	16.8	26.0	9.9	38.1	28.2
Clothing	8.9	(2)	(2)	11.0	.8	7.3	17.0	1.6	9.4	5.5
Iron and steel	1.2	(2)	(2)	.6	(2)	(2)	1.0	(2)	(2)	.2
Nonferrous metals	3.5	(2)	(2)	4.0	1.6	40.0	6.0	8.0	133.3	11.4
Other	[3] 18.0	.2	1.1	[3] 2.6	.1	3.8	[3] 22.0	.8	3.6	1.2
Total	144.4	4.9	3.4	201.3	32.3	16.0	281.0	64.0	22.8	144.7

[1] "N" stands for the normalized value, and "A", the actual value. Actual values are based on U.S. Bureau of Census data. The methodology and data used to estimate normalized values are explained in app. B.
[2] Zero or negligible.
[3] Including statistical discrepancies.

The data in table 2 suggest that PRC exports to the United States have remained considerably below "normalized" flows for all major commodity categories. Among the subcategories listed in the table, actual flows exceeded "normalized" flows in 1973, and probably also in 1974, in only one case: nonferrous metals which mainly consisted of tin and tin alloys. Exports of crude animal materials dominated by bristles rose sharply in 1972, exceeding the "normalized" level, but showed no significant changes in 1973 and 1974. Exports of textile fibers, mainly raw silk, increased rapidly in 1972 and 1973, but declined in 1974. The export subcategory of animals, meat, and fish expanded sharply in 1974 largely due to increases in shrimps and prawns.[61]

Under normalized trade relations the United States could be expected to account for about 6 percent of PRC export trade.[62] Actually the U.S. share was 0.2 percent in 1971, 1.1 percent in 1972, 1.3 percent in 1973, and 2 percent in 1974. At the present time, therefore, the United States is not a major market for Chinese exports. When trade relations are normalized, the United States may be expected to become

[60] There were virtually no PRC exports to this country in 1970, the final year of total embargoes by the United States. The only products which Americans purchased from mainland China through third countries in 1970 were carpets, carpeting, and rugs, valued at $1,000.
[61] For a list of 50 leading PRC exports to the United States in 1973–74, see Clarke and Avery, *op. cit.*
[62] This percentage was derived in my unpublished paper, "The Potential of Trade between the United States and the People's Republic of China," prepared at the Bureau of East-West Trade.

the third largest importer of Chinese products after Japan and Hong Kong.

Although there exists a potential for the United States to become an important importer of Chinese products, the relative share of the PRC in U.S. imports will not be of any potential significance. The PRC share in U.S. imports was only 0.01 percent in 1971. 0.06 percent in 1972, 0.09 percent in 1973, and 0.11 percent in 1974. Even if PRC exports were to reach the normalized level, its share in U.S. import trade would be only 0.4 percent.[63] For certain individual commodities, however, mainland China has become an important source of supply to the United States. In 1972, for example, the PRC share in U.S. imports was 71 percent for gum turpentine, 54 percent for raw silk, 51 percent for bristles, and 36 percent for cassia and related products.[64] In 1973, the share became 74 percent for raw silk, 45 percent for walnuts, 39 percent for bristles, 38 percent for cotton printcloth, and 27 percent for fireworks, flares, and other chemical signals.[65]

2. PRC Imports from the United States

Data on normalized and actual imports by the PRC from the United States are presented in table 3. Actual imports are shown for 1972 to 1974; "normalized" imports were estimated for 1972 and 1973. PRC imports from the United States were nearly zero in 1970 and 1971,[66] amounted to 21 percent of the "normalized" volume in 1972, and exceeded it by 25 percent in 1973.

TABLE 3.—NORMALIZED AND ACTUAL PRC IMPORTS FROM THE UNITED STATES, 1972–74 [1]

[In millions of U.S. dollars and percent]

	1972			1973			1974 [2]
	N	A	$\frac{A}{N}$x100	N	A	$\frac{A}{N}$x100	A
Foodstuffs	161	75	47	226	506	224	405
Crude materials, fuels and edible oils, of which	29	2	7	37	210	568	[3] 412
Rubber	3	(4)	(4)	3	(4)	(4)	(4)
Textile fibers	13	(4)	(4)	14	114	814	225
Chemicals, of which	51	(4)	(4)	108	9	8	12
Fertilizers	35	(4)	(4)	69	5	7	(4)
Manufactures, of which	135	2	1	275	86	31	138
Textile yarn and fabric	2	(4)	(4)	4	(4)	(4)	(4)
Iron and steel	23	(4)	(4)	52	(4)	(4)	(4)
Nonferrous metals	7	(4)	(4)	23	7	30	(4)
Machinery and equipment	50	2	4	109	76	70	118
Other	[5] 2	(4)	(4)	[5] 4	1	25	(4)
Total	378	79	21	650	812	125	967

1 "N" stands for the normalized value, and "A", the actual value.
2 Preliminary.
3 Including shipments of U.S. soybeans via Canada.
4 Zero or negligible.
5 Including statistical discrepancies.

Source: Actual values are based on CIA, "People's Republic of China: International Trade Handbook," September 1974, tables 8 and 9 and U.S. Bureau of Census data. Values are shown on a c.i.f. basis. The methodology and data used to estimate normalized values are explained in app. B.

63 Ibid.

64 In 1972 other Chinese commodities of relative importance in U.S. imports included gelatin and animal glue (12 percent), crude feather (11 percent), fireworks (6 percent), and antiques (6 percent).

65 In 1973 other Chinese commodities of relative importance in U.S. imports included hair of the cashmere goat and like hair (25 percent), wood and resin-based chemical products (22 percent), citronella oil (22 percent), cassia, cassia buds, and cassia vera (15 percent), gum and spirits of turpentine (14 percent), gelatin, animal and fish glues, and isinglass (14 percent), and red pepper (9 percent).

66 The PRC imported very small amounts of manufactured articles from the United States in 1970 and 1971, valued at $1,000 and $2,000 respectively.

PRC imports from the United States in the last 3 years have been dominated by agricultural commodities. In 1972 these commodities, consisting of wheat, corn, and soybeans, accounted for 97 percent of imports from the United States, while nonagricultural imports included mainly telecommunications equipment. In 1973 both the volume and variety of agricultural imports from the United States increased, with wheat, corn, raw cotton, soybeans, and soybean oil constituting the bulk of these imports. Agricultural commodities still made up 85 percent of the import total, and the remainder consisted of aircraft and parts (7 percent), iron and steel scrap (3 percent), nonferrous metals (1 percent), chemical fertilizers (1 percent), and other industrial goods. Actual PRC imports from the United States fell short of "normalized" imports for all categories in 1972, but exceeded them by large margins for both foodstuffs and crude materials in 1973. In that year, imports of chemicals and manufactures still remained considerably below the "normalized" levels.

Agricultural commodities continued to dominate PRC imports from the United States in 1974, but their import share fell to 81 percent of total value. The variety of industrial imports from the United States expanded significantly last year, and over one-third of these imports were attributable to the completion of the delivery of aircraft and parts for which the PRC signed a purchase contract with the Boeing Co. in 1972.[67]

Under normalized commercial relations, in the early 1970's the United States could have supplied 12 to 16 percent of PRC imports.[68] In fact, the U.S. share was zero in 1970 and 1971, nearly 3 percent in 1972, and rose to over 16 percent in 1973, and some 13 percent in 1974.

While the United States has become and probably will continue to be an important supplier of certain commodities to China, the relative importance of the PRC in U.S. export trade has been small. In 1972 China took only one-tenth of 1 percent of U.S. exports. When the PRC purchased substantial quantities of American agricultural products in 1973 and 1974, it accounted for no more than 1 percent of U.S. exports in both years. For certain U.S. commodities, however, the PRC became an important buyer thus providing significant impact on some segments of the American economy. In 1973, China's shares in U.S. exports were 7 percent for wheat, 5 percent for corn, 11 percent for raw cotton, 12 percent for soybean oil, and 4 percent for iron and steel scrap. In 1974 these shares became 5 percent for wheat, 3 percent for corn, 4 percent for soybeans, and 14 percent for raw cotton.

3. Prospects for United States-PRC Trade

To sum up, the striking feature of PRC imports from the United States since the resumption of trade between the two countries has been the overwhelming importance of agricultural commodities. Their relative weight, however, has declined, and probably will continue to decrease in view of several considerations. First of all, Chinese purchases of U.S. agricultural commodities in the last 2 years appeared to be abnormally large. As shown in appendix table A.4, China im-

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[67] For a list of 50 leading PRC imports from the United States in 1973–74, see Clarke and Avery, *op. cit.*

[68] Chen, "The Potential of Trade Between the United States and the People's Republic of China."

ported 5.3 to 6.8 million tons of grains between 1961 and 1966, and 3 to 4.8 million tons between 1967 and 1972. Grain imports jumped to 7.7 metric million tons in 1973, and 7 metric million tons in 1974, with the United States supplying 52 percent and 40 percent of the respective totals. In addition, the PRC imported for the first time large quantities of soybeans, entirely from the United States. China is a consistent importer of raw cotton, and the United States supplied about 40 percent of this category of Chinese imports during 1973–74.

The large importation of U.S. agricultural commodities by the PRC during 1973–74 is traceable to abnormally poor weather conditions in China in 1972. Farm production fell in that year. As Sino-American trade relations began to improve, the PRC turned to the United States for supplies. China has contracted to purchase grain from Canada and Australia in the next few years. It will most likely continue to rely on these two countries and the United States for imports to make up domestic shortages in agricultural goods. Under normal harvest conditions, however, China may not be expected to continue in the future importing large quantities of U.S. grain. This will particularly be the case if the PRC becomes successful in implementing its measures for raising agricultural productivity and controlling population growth.

Raw cotton was China's leading import from the United States in prewar years. China's demand for this commodity has increased rapidly, and may rise further because of the necessity to step up textile production to meet increasing domestic consumption and export requirements.[69] The recent reentry of the United States into the Chinese cotton import market may signify that China probably will look to the United States for a significant part of its cotton supply. In the short run, China's demand for American cotton will depend upon domestic harvest conditions and foreign demand for Chinese textile products, which in turn depends upon a host of factors, particularly the general economic situation and textiles inventories of the importing countries. An improved cotton crop, the worldwide recession, and excessive inventories of certain countries were mainly responsible for China's cancellation of raw cotton imports from the United States in early 1975. In the long run, however, China's import requirements of raw cotton will be affected by the domestic capacity to supply synthetic fibers, the production of which undoubtedly will have expanded as a result of the new plants currently on order in Japan and Western Europe.

As United States-PRC trade continues to develop, China will probably purchase increasing quantities of American industrial products. The PRC appears to have a large demand for industrial raw materials, plant, equipment, and technology, but the United States will very likely face strong competition from Japan and Western Europe. The best export potential for the United States appears to be in certain areas of advanced technology and equipment for which the PRC could have large demand and in which the United States possesses special advantages. China has purchased aircraft from the Boeing Co., fertilizer plants from the M. W. Kellogg Co., anad a number of other American industrial products, and the scope of industrial purchases

[69] The shortfalls in raw cotton production necessitated imports which fluctuated between 64,000 and 168,000 tons annually in the second half of the 1960's. Major suppliers were Pakistan, Syria, Tanzania, Sudan, Egypt, and other Middle Eastern and African countries.

from the United States is likely to expand. It may be expected that the relative weight of industrial products in PRC imports from the United States will rise over time and that of agricultural products will decline. The size of PRC imports from the United States in the next few years, therefore, will depend in a large mesaure upon the rapidity with which China will expand imports of American industrial products. This, in turn, will be determined by a number of factors, both political and economic. Most important among them appear to be China's general economic and foreign trade policies, and its specific policy toward imported technology and equipment. These policies will be examined in the following section. In the remainder of this section, we allude to another important factor: the capacity of the PRC to expand imports to the United States.

The balance of the United States-PRC trade since its resumption has been heavily in favor of the United States. The ratio of PRC imports from and exports to the United States was 2.5:1 in 1972, 13:1 in 1973, and 8:1 in 1974. Although the PRC policy has been to maintain an overall balance in trade largely by using excess exports to Hong Kong and Southeast Asia to finance trade deficits with the industrialized West, the large deficits with the United States have caused some concern to the Chinese. PRC imports from the United States in 1974 were smaller than anticipated early in that year partly resulting from Chinese efforts to cut back purchases. At the same time, the PRC appears to be interested in expanding exports to the United States as evidenced by invitations to an increased number of American businessmen to attend the Canton Trade Fair and to the representatives of the American Importers Association to visit China, and by the recent visit of a Chinese textile mission to this country.

As noted above, PRC exports to the United States, as of 1974, still fell considerably short of the "normalized" level. A number of factors are probably responsible for the gap. Most frequently mentioned are the twin issues of Chinese frozen assets and American private claims and the absence of most-favored-nation tariff treatment. Other probable factors include: (1) limited capabilities of Chinese export industries to expand supply rapidly and Chinese reluctance to reduce exports to traditional customers; (2) slow adaptation of Chinese exporters to American marketing techniques; (3) inability of the Chinese to style products for the rapidly changing American market; (4) peculiar Chinese practices of pricing export commodities, such as tiered pricing systems favoring Third World countries; (5) lack of knowledge of American importers about Chinese products and trading methods; (6) inadequate shipping and financial facilities; (7) large transportation costs; and (8) U.S. nontariff regulations.[70] The gradual removal of these barriers will facilitate PRC exports to the United States, thus making the Chinese both more willing and able to expand the importation of American products.

VI. The Outlook for PRC Trade Growth

In the long run, China's trade in general, and with the United States in particular, will be governed basically by its economic and foreign

[70] Some of these factors were mentioned by David Denny in his paper. "The Effect of Normalized Commercial Relations on PRC Exports to the United States," People's Republic of China Affairs Division, Bureau of East-West Trade, U.S. Department of Commerce, November 1973. For a discussion of these and other issues and problems of United States-PRC commercial relationship, see Clarke and Avery, *op. cit.*

trade policies. Inasmuch as the best export potential for the United States will most likely be in certain areas of advanced technology and equipment, the Chinese policy toward imported capital goods, especially those of an advanced nature, is of particular importance.

One of China's economic goals since the founding of the People's Republic has been to build China into a modern industrial country in the shortest time possible. Rapid industrial growth will depend mainly on the expansion of modern industry. One major determinant of the rapidity of modern industrial expansion would be the ability to secure in adequate quantities advanced technology and equipment from developed countries, which, in turn, hinges on the ability of the Chinese to finance such imports. As long as the PRC maintains its long-held balanced-trade policy of paying for imports with export earnings, the size of imports will continue to depend on export capabilities.

In this regard, sustained growth of agricultural productivity is of crucial importance. Improvements in agricultural production not only will reduce grain import requirements, but also may expand the capability to export thus allowing larger industrial imports. For example, the increased supply of chemical fertilizers, which has been an essential ingredient of China's program to raise agricultural productivity, is particularly conducive to the growth of rice output, and as alluded to earlier, rice could very well become an attractive foreign exchange earner in the future.

China's export capabilities can be significantly enhanced by the development of the petroleum industry. As noted above, China either has begun, or is under negotiation, to export crude oil and petroleum products to some of the Pacific Basin countries. Given its resource endowments, China conceivably could also develop labor-intensive export industries to augment foreign exchange earnings. It has been suggested, for example, that the electronics industry in Hong Kong could absorb substantial quantities of component parts made in China. But with the keen competition among exporters of labor-intensive products, particularly in Asia, the likelihood for the PRC to achieve export-led industrial growth of the Japanese or Taiwanese order appears to be small. The best prospect to expand export income remains in the area of crude oil and, probably, rice.

To gain some idea about what increases in the output of these products will mean in export income, let us assume that China will manage to export 75 million tons of crude oil and 3 million tons of rice by 1980. Needless to say, these exports will depend on a variety of factors: output, domestic needs, and world prices for these products, among others. At current prices these two items of assumed exports alone would yield in the neighborhood of $8 billion, more than the entire amount of China's 1974 export income.[71] This would permit China to increase significantly the importation of needed industrial goods.[72]

Whether the PRC will succeed in achieving the levels of grain and oil production not only to meet domestic needs and also to generate

[71] It should be noted, however, that world prices for these products may not remain at current levels. Oil prices could go down by 1980 if Alaskan and North Sea oil would become available in substantial quantity. On the other hand, rice prices which, as oil prices, have gone up considerably in the last few years, will likely remain high if the worldwide food situation does not improve.

[72] For this and other points discussed in this section, I benefited from Walter Galenson's comments on my paper, "Industrial Development in Mainland China, 1949–74," presented at the Sino-American Conference on Mainland China in Airlie House, Warrenton, Va., Dec. 12–15, 1974.

sufficient export income remains to be seen. The Chinese Government has given both chemical fertilizer and petroleum industries highest priority in the allocation of its limited investment resources, but large investment in these industries alone will not guarantee their success. Their performance will hinge upon a number of factors. Probably the most crucial of them is whether the Chinese will be able to supply these industries with required quantities of high-quality inputs including, in addition to advanced types of machinery and equipment, trained technical manpower. Another important factor is the establishment of an adequate transport and distribution network to facilitate not only the process of production but also the delivery of products to end-users and for exports.

Aside from the point about China's ability to generate sufficient export income, another pertinent questiton is whether the PRC will be willing to import large quantities of industrial goods in view of political and ideological considerations. From the start the PRC has recognized the useful contribution that foreign trade can make toward building China rapidly into a strong modernized country.[73] Foreign trade policy, therefore, has been an important component of China's overall policy for national economic development. Although the PRC has adopted a policy of placing heavy emphasis on self-reliance, foreign trade is considered as a means to facilitate the implementation of such policy.[74] Foreign Trade Minister Li Chiang in an article published in July 1974 anticipated a continuing growth of China's foreign trade when he stated:

> China's future potentialities in foreign trade are substantial * * *. Generally we will be able to export more and better goods * * *. At the same time, China's imports will be increased accordingly. Without doubt, our trade with other countries will continue to broaden.[75]

Although in the official view the principle of self-reliance does not imply a rejection of foreign trade, the policy toward imported technology and equipment has been often debated in China. In early 1974 the debate was resumed with increased intensity.[76] The discussion revealed that there were some in China advocating substantial purchases of industrial equipment from abroad. Participants in the discussion seemed to agree that China could benefit from learning the advanced techniques of developed countries, but argued that foreign technology and equipment should not be transplanted to China in toto without considering local adaptability. The principal issue, therefore, was not whether China should import technology and equipment at all, but the extent to which it should rely on foreign sources to meet economic plans for growth and modernization.

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[73] The *Common Program* promulgated on the eve of the founding of the People's Republic specifically stipulates: "The People's Republic of China will, on the basis of equality and mutual benefit, resume and develop commercial and trade relations with various nations." The same point was made in an authoritative article in the Party journal of *Hung-ch'i* published in October 1969. The article states: "On the basis of the principle of respect for national sovereignty and independence, complete equality and mutual benefit, economic cooperation and trade with friendly countries are necessary."

[74] This is evidenced in the statements recently made by a number of officials, including the speech by Deputy Premier Teng Hsiao-ping at the special session of United Nations General Assembly in April 1974. See *Peking Review*, No. 16, Apr. 19, 1974, pp. 6–11.

[75] Li Chiang, "New Developments in China's Foreign Trade," No. 1, 1974, pp. 1–5; quotation on p. 5.

[76] The revival of the discussion came with the publication of two articles in the January and February 1974 issues of *Hung-ch'i* (Red Flag). Two articles in *Jen-min jih-pao* (People's Daily) of Mar. 22, 1974, related the discussion, and another was published on May 3 of the same year.

Although the genesis of this complicated debate is not known,[77] it has not resulted in a cessation of imports of technology and equipment. Following a dramatic rise in import commitments by the PRC in 1973, no significant cutback in buying was in evidence during the first half of 1974 when overreliance on foreign technology and equipment was at issue. Although some slowdown in purchases has been noticed since mid-1974, it is mainly due to Chinese concerns of a too great diminution of foreign exchange reserves. China's continuing interests in foreign technology, plant, and equipment also were reflected in the growing number of countries to hold industrial exhibitions in China during 1974, all of which appeared to have enthusiastic support from the Chinese Government.[78]

The present PRC policy has been spelled out in a number of recent official statements. Several months after the most recent debate was underway, Minister Li stated:

> China welcomes technical interchange with other countries and imports essential equipment on a planned and selective basis according to the needs of her socialist construction.[79]

Chairman of the China Council for the Promotion of International Trade Wang Yao-ting explained further in an October 1974 article:

> While adhering to the policy of self-reliance, China, in order to meet the needs of carrying out the national economic plan, has imported some ferrous and nonferrous metals, vehicles, ships, planes, machinery, rubber, chemical fertilizers, insecticides, paper pulp, et cetera, and has purchased in a planned way complete sets of equipment for making oxygen and generating electricity and rolling mills. This is done with a view to developing the country's industrial and agricultural production and accelerating socialist economic construction.[80]

It becomes clear, therefore, that China's continuing policy calls for an increasing foreign trade and imports of some foreign technology and equipment. If this policy continues and if China becomes successful in generating sufficient export income, in the long run its trade with the industrialized West including the United States may be expected to grow.

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[77] The debate may have triggered by several factors. One was the desire of Chinese planners to tighten the scrutiny of requests to buy foreign equipment. One report cited evidence of a large number of requests from factories all over China for imports of foreign equipment stimulated by improvements of trade relations with the West. All such requests could hardly be satisfied without straining the limited amount of Chinese foreign exchange reserves. Another factor might involve attempts by Chinese authorities to maintain the maximum pressure on industrial plants to pioneer and propagate new techniques of their own. Extensive domestic innovations have taken place in the PRC. Chinese planners were concerned with the possibility that the incentive for the industrial sector to develop its own techniques would be dampened if foreign equipment and technology were imported in large quantities. This was especially true in China's vast rural areas where hundreds of thousands of small plants had to make do with their own resources. For a discussion of the debate, see Nai-Ruenn Chen, "China's Foreign Trade Policy: A Current Appraisal," *Overseas Business Reports*, U.S. Department of Commerce, October 1974.

[78] During 1974 12 countries held industrial exhibitions in Peking, Shanghai, and Tientsin. These countries were Australia, Austria, Canada, Denmark, France, Hungary, Japan, Mexico, Poland, Romania, Sweden, and Switzerland. More exhibitions are scheduled in 1975.

[79] Li Chiang, *op. cit.*

[80] Wang Yao-ting, "China's Foreign Trade," *Peking Review*, 41, Oct. 11, 1974, pp. 18–20 and 26; quotation on p. 19.

APPENDIX A

STATISTICAL TABLES

TABLE A. 1.—PRC FOREIGN TRADE, 1950–74 [1]

[In millions of U.S. dollars]

Year	In current prices			In constant prices [3]		
	Turnover	Exports	Imports	Turnover	Exports	Imports
1950	1,210	620	590	----	----	----
1951	1,900	780	1,120	----	----	----
1952	1,890	875	1,015	1,800	795	1,005
1953	2,295	1,040	1,255	2,290	995	1,295
1954	2,350	1,060	1,290	2,275	930	1,345
1955	3,035	1,375	1,660	3,010	1,295	1,715
1956	3,120	1,635	1,485	3,115	1,560	1,555
1957	3,055	1,615	1,440	2,910	1,530	1,380
1958	3,765	1,940	1,825	3,765	1,940	1,825
1959	4,290	2,230	2,060	4,400	2,315	2,085
1960	3,990	1,960	2,030	3,990	1,920	2,070
1961	3,015	1,525	1,490	3,060	1,540	1,520
1962	2,675	1,525	1,150	2,765	1,585	1,180
1963	2,770	1,570	1,200	2,770	1,570	1,200
1964	3,220	1,750	1,470	3,120	1,685	1,435
1965	3,880	2,035	1,845	3,790	2,005	1,785
1966	4,245	2,210	2,035	4,070	2,155	1,915
1967	3,895	1,945	1,950	3,770	1,930	1,840
1968	3,765	1,945	1,820	3,655	1,920	1,735
1969	3,860	2,030	1,830	3,610	1,920	1,690
1970	4,290	2,050	2,240	3,755	1,865	1,890
1971	4,720	2,415	2,305	4,060	2,180	1,880
1972	5,920	3,085	2,835	4,685	2,570	2,115
1973	9,870	4,895	4,975	5,760	3,000	2,760
1974 [2]	13,715	6,305	7,410	5,930	2,765	3,165

[1] Exports are valued on an f.o.b. basis, and imports, on a c.i.f. basis. Data are rounded to the nearest $5,000,000.

[2] Preliminary.

[3] In 1963 prices.

Sources: Data in current prices: Central Intelligence Agency, "People's Republic of China: International Trade Handbook," Washington, D.C., September 1974.

Data in constant prices: Data in current prices for 1952 through 1972 were adjusted by the export and import deflator series with 1963 as the base year in Alexander Eckstein, "China's Economic Growth and Foreign Trade," "U.S.-China Business Review," vol. 1, No. 4 (July-August 1974). 1973 trade deflators were derived from "Yearbook of International Trade Statistics 1972–73" (Statistical Office of the United Nations, New York, 1974) according to the procedure outlined in Alexander Eckstein and Bruce Reynolds, "Sino-American Trade Prospects and Policy," "American Economic Review, Papers and Proceedings," vol. 64, No. 2 (May 1974), pp. 289–93. Export and import deflators for 1974 are crude estimates derived on the basis of partial data on PRC trade with Hong Kong and Japan.

TABLE A.2.—COMMODITY COMPOSITION OF PRC IMPORTS, 1966–73[1]

[In millions of U.S. dollars and in percent of total imports]

Commodity category	1966		1967		1968		1969		1970		1971		1972		1973	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Foodstuffs, of which	510	[illegible]	380	19	410	23	350	19	355	16	290	13	455	16	1,000	20
Grains	400	[illegible]	295	15	305	17	260	14	280	13	205	9	345	12	840	17
Crude materials, fuels, and edible oils, of which	340	[illegible]	320	16	300	16	310	17	370	17	385	17	550	19	985	20
Rubber	85	4	75	4	85	5	145	8	80	4	55	2	70	2	165	3
Textile fibers	150	7	150	8	100	5	90	5	110	5	140	6	205	7	400	8
Chemicals, of which	250	12	285	15	315	17	310	17	330	15	325	14	360	13	445	9
Fertilizers	155	8	200	10	200	11	205	11	230	10	200	9	190	7	220	4
Manufactures, of which	910	45	945	48	775	43	850	46	1,175	52	1,295	56	1,455	51	2,505	50
Textile yarn and fabrics	35	2	45	2	40	2	30	2	45	2	40	2	40	1	70	1
Iron and steel	225	11	320	16	265	15	275	15	405	18	465	20	510	18	930	19
Nonferrous metals	55	3	85	4	125	7	225	12	210	9	150	7	235	8	400	8
Machinery and equipment	455	22	380	19	275	15	240	13	395	18	505	22	520	18	855	17
Other	25	1	20	1	20	1	10	1	10	([2])	10	([2])	15	1	40	1
Total	2,035	100	1,950	100	1,820	100	1,830	100	2,240	100	2,305	100	2,835	100	4,975	100

[1] Imports are valued on a c.i.f. basis. Value data are rounded to the nearest $5,000,000. Components may not add to the totals shown due to rounding.
[2] Less than half of 1 percent.

Source: U.S. Central Intelligence Agency, "People's Republic of China: International Trade Handbook," Washington, D.C., December 1972; October 1973; and September 1974.

TABLE A.3.—COMMODITY COMPOSITION OF PRC EXPORTS, 1966–73[1]

[In millions of U.S. dollars and in percent of total exports]

Commodity category	1966		1967		1968		1969		1970		1971		1972		1973	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Foodstuffs, of which	615	28	510	26	535	28	615	30	645	31	740	31	955	31	1,595	33
Animals, meat and fish	230	10	170	9	175	9	210	10	215	10	275	11	335	11	485	10
Grains	150	7	140	7	130	7	115	6	110	5	95	4	155	5	535	11
Fruits and vegetables	120	5	125	6	140	7	175	9	170	8	155	6	180	6	225	5
Crude materials, fuels, and edible oils, of which	480	22	440	23	415	21	450	22	430	21	475	20	600	19	870	18
Oilseeds	90	4	90	5	85	4	75	4	65	3	15	1	15	(2)	105	2
Textile fibers	105	5	100	5	90	5	120	6	100	5	120	5	205	7	290	6
Crude animal materials	90	4	75	4	100	5	130	6	115	6	105	4	115	4	165	3
Chemicals	90	4	85	4	85	4	90	4	105	5	130	5	160	5	245	5
Manufactures, of which	920	42	850	44	850	44	820	40	855	42	1,055	44	1,340	43	2,160	44
Textile yarn and fabric	305	14	250	13	270	14	310	15	340	17	325	13	460	15	795	16
Clothing	185	8	170	9	180	9	195	10	155	8	155	6	190	6	275	6
Iron and steel	90	4	70	4	25	1	35	2	40	2	65	3	65	2	110	2
Nonferrous metals	40	2	35	2	25	1	35	2	25	1	45	2	30	1	50	1
Other	105	5	60	3	60	3	55	3	15	1	15	1	30	1	25	1
Total	2,210	100	1,945	100	1,945	100	2,030	100	2,050	100	2,415	100	3,085	100	4,895	100

[1] Exports are valued on an f.o.b. basis. Value data are rounded to the nearest $5,000,000. Components may not add to the totals shown due to rounding.

[2] Less than half of 1 percent.

Sources: U.S. Central Intelligence Agency, "People's Republic of China: International Trade Handbook," Washington, D.C., December 1972; October 1973; and September 1974.

TABLE A.4.—PRC GRAIN IMPORTS, 1961–74

Year	Million metric tons	Million U.S. dollars [1]
1961	6.2	435
1962	5.3	370
1963	5.7	400
1964	6.8	475
1965	5.7	400
1966	5.6	400
1967	4.1	295
1968	4.4	305
1969	3.9	260
1970	4.6	280
1971	3.0	205
1972	4.8	345
1973	7.7	840
1974	7.0	1,145

[1] Values are c.i.f. and are rounded to the nearest $5,000,000.

Source: 1961–65: A. H. Usack and R. E. Batsavage, "The International Trade of the People's Republic of China," in U.S. Joint Economic Committee, "People's Republic of China: An Economic Assessment," Washington, D.C., 1972, p. 348. 1966–73: U.S. Central Intelligence Agency, "People's Republic of China: International Trade Handbook," Washington, D.C., September 1974, p. 15. 1974: The ton figure was supplied by U.S. Department of Agriculture. The value figure is a preliminary estimate.

TABLE A.5.—PRC TRADE WITH OTHER SOCIALIST COUNTRIES, 1950–74 [1]

[In millions of U.S. dollars]

Year	Total		U.S.S.R.		Eastern Europe [2]		Asian Socialist countries [3]		Other [4]	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
1950	210	140	190	135	15	5	5	0		
1951	465	515	305	445	140	65	20	5		
1952	605	710	415	550	165	155	25	5		
1953	670	885	475	690	150	190	45	5		
1954	765	970	550	720	130	240	85	10		
1955	950	1,300	645	1,055	200	235	105	10		
1956	1,045	1,010	745	715	195	265	95	25	10	5
1957	1,085	880	750	545	240	285	85	45	10	5
1958	1,280	1,100	880	635	290	410	110	50	0	5
1959	1,615	1,365	1,100	955	350	325	160	85	5	0
1960	1,335	1,285	850	815	310	335	160	95	15	40
1961	965	715	550	365	145	160	160	95	110	95
1962	915	490	515	235	105	65	170	90	125	100
1963	820	430	415	185	115	50	165	100	125	95
1964	710	390	315	135	100	60	135	90	160	105
1965	650	515	225	190	95	110	130	90	200	125
1966	585	505	145	175	130	140	150	80	160	110
1967	485	345	55	50	110	135	180	60	140	100
1968	500	340	35	60	140	135	180	60	145	85
1969	490	295	30	25	145	120	145	55	170	95
1970	480	380	20	25	160	160	125	65	170	100
1971	585	500	75	80	195	250	150	75	165	95
1972	740	535	135	120	230	265	180	80	195	70
1973	995	705	135	135	305	300	355	125	200	145
1974 [5]	1,370	930	140	140	345	315	580	155	305	320

[1] Exports are valued on an f.o.b. basis, and imports, on a c.i.f. basis. Data are rounded to the nearest $5,000,000.
[2] Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania.
[3] Includes North Korea, North Vietnam, and Mongolia.
[4] Includes Albania, Cuba, and Yugoslavia.
[5] Preliminary.

Source: Robert L. Price, "International Trade of Communist China, 1950–65," and Central Intelligence Agency, "Communist China's Balance of Payments, 1950-65," both in U.S. Joint Economic Committee, "An Economic Profile of Mainland China," Washington, D.C., 1967, pp. 579-608 and pp. 621-660, respectively; A. H. Usack and R. E. Batsavage, "The International Trade of the People's Republic of China," in U.S. Joint Economic Commitee, "People's Republic of China: An Economic Assessment," Washington, D.C., 1972, pp. 335–370; and U.S. Central Intelligence Agency, "People's Republic of China: International Trade Handbook," December 1972, October 1973, and September 1974.

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TABLE A.6.—PRC TRADE WITH NON-SOCIALIST COUNTRIES, 1961–74 [1]

[In millions of U.S. dollars]

Year	Total		United States		Canada		Western Europe											
							Total		France		Italy		United Kingdom		West Germany		Other	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
1961	560	775	(2)	0	3	150	181	234	13	41	10	38	73	52	35	46	50	57
1962	605	660	0	0	4	153	149	170	15	51	12	23	50	28	32	36	40	32
1963	755	770	(2)	0	5	106	172	184	19	67	19	21	47	35	34	18	53	43
1964	1,040	1,080	(2)	0	9	148	229	196	28	43	21	20	59	56	49	20	72	57
1965	1,385	1,330	(2)	0	15	118	300	350	39	63	34	53	77	75	65	72	85	87
1966	1,625	1,530	(2)	(2)	20	195	365	510	48	111	52	61	82	96	82	135	101	107
1967	1,460	1,605	(2)	(2)	25	105	310	720	40	102	49	89	68	135	65	231	88	163
1968	1,445	1,480	(2)	(2)	25	160	335	625	51	119	43	83	71	70	76	196	94	157
1969	1,540	1,535	(2)	(2)	27	129	380	565	65	45	57	71	79	132	78	202	101	115
1970	1,570	1,860	(2)	(2)	22	154	355	660	57	97	56	76	69	143	70	200	103	144
1971	1,830	1,805	5	(2)	28	213	410	575	67	125	56	71	69	92	89	160	129	127
1972	2,345	2,300	32	79	49	296	460	605	91	67	73	88	77	90	92	190	127	170
1973	3,900	4,270	64	812	53	356	665	1,025	128	103	112	84	102	238	130	357	193	243
1974 [3]	4,935	6,480	115	967	60	515	820	1,350	160	188	102	121	136	193	168	482	254	366

See footnotes at end of table.

TABLE A-6.—PRC TRADE WITH NONSOCIALIST COUNTRIES, 1961–1974 [1]—Continued

Year	Australia and New Zealand		Japan		Hong Kong and Macao [4]		Malaysia and Singapore		Other Southeast Asian countries, South Asia and Near East		Latin America		Africa		Other [5]	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
1961	9	200	29	17	115	1	54	9	138	127	2	9	29	28	-----	-----
1962	13	110	44	40	138	2	64	(2)	162	130	2	34	31	22	-----	-----
1963	17	226	71	66	170	2	90	6	178	122	1	7	34	54	-----	-----
1964	27	180	150	160	253	2	95	1	220	172	2	155	54	54	-----	-----
1965	39	193	221	257	355	5	115	10	250	215	5	105	85	75	-----	-----
1966	30	104	300	331	400	5	100	45	310	185	5	105	95	50	-----	-----
1967	34	217	266	303	310	1	135	50	270	145	5	10	105	55	-----	-----
1968	38	120	222	345	325	1	165	55	235	115	10	0	90	60	-----	-----
1969	41	135	239	415	340	1	155	105	255	115	10	(2)	95	70	-----	-----
1970	45	140	255	600	370	5	140	50	250	140	10	5	125	70	(2)	(2)
1971	43	33	322	607	445	5	170	35	210	125	10	55	185	155	(2)	(2)
1972	62	50	468	640	535	5	190	45	320	215	20	210	195	155	15	(2)
1973	97	167	928	1,093	825	10	325	135	595	220	45	255	285	185	20	10
1974 [3]	135	385	1,245	2,085	910	20	(6)	(6)	(6)	(6)	90	440	420	190	40	15

[1] Exports are valued on an f.o.b. basis, and imports, on a c.i.f. basis. Components do not always add up to the totals shown due to rounding.
[2] Less than $500,000.
[3] Preliminary.
[4] Net of entrepot trade with third countries.
[5] Includes Spain, Portugal, Greece, and Malta.
[6] Not available.

Sources: Robert F. Dernberger, "Prospects for Trade between China and the United States," in Alexander Eckstein (ed.), "China Trade Prospects and U.S. Policy," New York: Praeger Publishers, 1971; Robert L. Price, "International Trade of Communist China 1950–65," in U.S. Joint Economic Committee, "An Economic Profile of Mainland China," Washington, D.C., 1967; A. H. Usack and R. E. Batsavage, "The International Trade of the People's Republic of China," in U.S. Joint Economic Committee, "People's Republic of China: An Economic Assessment," Washington, D.C., 1972; U.S. Central Intelligence Agency, "People's Republic of China: International Trade Handbook," December 1972; October 1973; and September 1974; and "Yearbook of International Trade Statistics—1964," New York: United Nations, 1966.

Appendix B

Methodology and Data Used in Estimating "Normalized" Flows of United States-PRC Trade

The Methodology

The "normalized" volume of PRC exports to the United States during a given year may be derived by first estimating the values of major categories of Chinese commodities that would have been exported to the United States under normal trading relations and then aggregating the "normalized" values of these categories. Suppose X is a category of commodities, and $X_{\text{PRC-IW}}$ represents the value of X exported by the PRC to the industralized countries of the West during a given year and $X_{\text{PRC-ALL}}$, the value of X exported by the PRC to all countries in the world during the same year. By dividing $X_{\text{PRC-IW}}$ by $X_{\text{PRC-ALL}}$, the fraction may be taken to represent the probability the PRC export of X went to the industrialized West, given an export of X by the PRC, i.e., $P(X_{\text{PRC-IW}})$. Symbolically, we have

$$P(X_{\text{PRC-IW}}) = \frac{X_{\text{PRC-IW}}}{X_{\text{PRC-ALL}}} \tag{1}$$

Assume that $X_{\text{ALL-IW}}$ is the value of X imported by the industrialized West from all countries during a given year and $X_{\text{ALL-US}}$, the value of X imported by the United States from all countries. The ratio of $X_{\text{ALL-US}}$ to $X_{\text{ALL-IW}}$ may be interpreted as the probability the importer was the United States, given an import of X by the Industrialized West, i.e., $P(X_{\text{US/IW}})$.
Symbolically, we have

$$P(X_{\text{US/IW}}) = \frac{X_{\text{ALL-US}}}{X_{\text{ALL-IW}}} \tag{2}$$

Statistically speaking, if $P(X_{\text{PRC-IW}})$ and $P(X_{\text{US/IW}})$ were independent, $P(X_{\text{PRC-US}})$, the hypothesized probability that the importer could have been the United States given an export of X by the PRC may be assumed to be

$$P(X_{\text{PRC-US}}) = P(X_{\text{PRC-IW}}) \cdot P(X_{\text{US/IW}}) \tag{3}$$

The assumption of statistical independence may be taken to mean the absence of trade barriers such as trade embargoes, differential tariffs, quotas, tiered pricing systems, and transport cost differences. The hypothesized probability of $P(X_{\text{PRC-US}})$ thus derived also may be considered as the share of the United States in PRC exports of X, which could be expected if trade relations between the two countries are normalized. The "normalized" value of X exported by the PRC to the United States during a given year may be derived by multiplying the actual value of X exported by the PRC to all countries in that year by the "normalized" share of the United States, i.e., $X_{\text{PRC-ALL}} \cdot P(X_{\text{PRC-US}})$. The same procedure may be applied to other categories of commodities which conceivably could have been exported by the PRC to the United States under normalized conditions.

The "normalized" volume of PRC imports from the United States may be derived in a similar manner. Suppose Y is a category of commodities, and $Y_{\text{IW-PRC}}$ represents the value of Y imported by the PRC from the industrialized West during a given year and $Y_{\text{ALL-PRC}}$, the value of Y imported by the PRC from all countries during the same year. The ratio of $Y_{\text{IW-PRC}}$ to $Y_{\text{ALL-PRC}}$ may be interpreted as the probability the PRC import of Y came from the industrialized West, given an import of Y by the PRC, i.e., $P(Y_{\text{IW-PRC}})$. Symbolically, we have

$$P(Y_{\text{IW-PRC}}) = \frac{Y_{\text{IW-PRC}}}{Y_{\text{ALL-PRC}}} \tag{4}$$

Likewise, the ratio of the value of Y exported by the United States during a given year to the value of Y exported by the industrialized West during the same year may be regarded as the probability the exporter was the United States, given an export of Y from the industrialized West, i.e., $P(Y_{\text{US/IW}})$. Assuming $Y_{\text{US-ALL}}$ and $Y_{\text{IW-ALL}}$ stand for the value of the export of Y from the United States and the industrialized West, respectively, to all countries, we have

$$P(Y_{\mathrm{US/IW}})=\frac{Y_{\mathrm{US-ALL}}}{Y_{\mathrm{IW-ALL}}} \tag{5}$$

If $P(Y_{\mathrm{IW-PRC}})$ and $P(Y_{\mathrm{US/IW}})$ were independent, the hypothesized probability that the exporter could have been the United States, given an import of Y by the PRC, i.e., $P(Y_{\mathrm{US-PRC}})$, may be derived as

$$P(Y_{\mathrm{US-PRC}})=P(Y_{\mathrm{IW-PRC}})\cdot P(Y_{\mathrm{US/IW}}) \tag{6}$$

The measure may be taken to represent the U.S. share in PRC imports of Y under normalized conditions. The "normalized value of Y imported by the PRC from the United States during a given year can be obtained by multiplying the actual value of Y imported by the PRC from all countries in that year by the "normalized" share of the United States, i.e., $Y_{\mathrm{ALL-PRC}}\cdot P(Y_{\mathrm{US-PRC}})$. The "normalized" values of other categories of PRC imports which conceivably could have come from the United States are estimated in the same way.

The Data

Four types of trade data are required for all commodity categories and subcategories: PRC exports to all countries and to the industrialized West; PRC imports from all countries and from the industrialized West; exports to all countries from the industrialized West and from the United States; and imports from all countries by the industrialized West and by the United States.

For PRC trade data, we relied on the estimates contained in Central Intelligency Agency, "People's Republic of China: International Trade Handbook" (December 1972; October 1973; and September 1974). These estimates are for broad commodity categories and subcategories only, and figures for detailed breakdowns are not available. Trade data for the industrialized West and the United States were based on "World Trade Annuals" prepared by the Statistical Office of the United Nations and the "Bulletins of Foreign Trade Statistics," series C, published by the Organization for Economic Cooperation and Development. These data were grouped into a number of commodity categories according to the classification adopted in the CIA Handbook for PRC data. Countries in the industrialized West are West European countries, the United States, Canada, Japan, Australia, and New Zealand.

INTERNATIONAL FINANCE IN THE PEOPLE'S REPUBLIC OF CHINA

By DAVID L. DENNY*

The past 5 years have witnessed significant changes in the foreign relations of the People's Republic of China. The increasing foreign economic relationships have been an important part of these policies. China's foreign trade has rapidly expanded both in terms of numbers of trading partners and of total trade turnover. Chinese foreign trade corporations have begun to purchase large-scale plant and equipment again, most of which will be paid for over a 5- to 7-year period. Finally, the PRC has increased its contacts with international economic organizations.

This paper explores the way the PRC conducts its international financial activities. Because of the lack of useful information on remittances, trade in "invisibles," gold sales and other aspects of the balance of payments, this paper is largely restricted to a discussion of the methods of financing commodity trade. The discussion will focus on two central themes: (1) To what extent is the PRC "becoming more flexible in its external transactions and moving closer to standard international practices"; [1] (2) Do PRC international financial procedures differ significantly from those followed in other centrally planned economies (CPE's)?

The discussion is divided into seven sections. In the first, PRC official policies concerning international finance are discussed. In the second, several aspects of recent PRC international trade are reviewed as background for an analysis of PRC international finance. Institutional aspects of PRC international economic relationships are examined in the third section. The fourth section discusses some important aspects of the financial provision of PRC trade contracts. The fifth section examines the fluctuations in the exchange rate of the Chinese currency. The sixth section analyzes the financial burdens imposed by the repayment schedule for Peking's recent purchases of agricultural and nonagricultural commodities. The possibility of PRC future membership in the International Monetary Fund and World Bank is explored in the final section.

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*International Trade Specialist, People's Republic of China Division, Bureau of East-West Trade, Department of Commerce. The present paper is an extension of research undertaken for an article entitled, "Recent Developments in the International Financial Policies of the People's Republic of China" in *China's Changing Role in the World Economy,* edited by Bryant Garth and the editors of the Stanford Journal of International Studies. Sections II, III, and IV of the present piece have been substantially abbreviated; readers may want to consult the earlier work for additional material. In the process of research I have received advice from a large number of colleagues in government and from businessmen. In particular, I have benefited from the research and editorial assistance of Martha Avery. I alone, of course, bear the responsibility for the views presented herein.

[1] C. Frederick Wiegold, "China Moves Into International Finance," *American Banker,* Mar. 10, 1975. Mr. Wiegold is paraphrasing the views of Mr. Louis Saubolle, a respected authority on China's international finance. Others have made the same point even more vigorously: Dick Wilson, "The Bank of China's Expanding Role in International Finance," *United States-China Business Review,* vol. 1, No. 6, pp. 21–26, and Christopher Lewis, "The Communist Capitalists," *Far Eastern Economic Review,* vol. 84, No. 13, Apr. 1, 1974, pp. 18–19.

I. PRC International Financial Policies

The key themes of Chinese international financial policy are self-reliance, retention of a maximum degree of control over international financial activities, and a substantial aversion to risk and speculation. The Chinese are known as consummate businessmen and bargainers as well—but it can be argued that at times economic advantage is sacrificed for stability and control.

The historical reasons for PRC concern about controlling its own economic future and insulating its economy from the effects of worldwide inflationary and deflationary pressures have been discussed elsewhere.[2] For these reasons, as well as for reasons of domestic economic stability, a priority concern for the PRC was to unify the currency and banking system, to nationalize the customs service, to quickly gain a monopoly over all foreign trade enterprises and to create the People's Bank of China (PBC) as the unit responsible for all domestic and international financial transactions. In Anthony Dick's words, the PBC:

> is responsible for the monetary affairs of the whole of the industrial and commercial sectors, and it has extensive powers of financial supervision over the organization to which it lends money * * * its control and supervision of the financial affairs of enterprises is all embracing. In the field of foreign trade the PRC acts in three capacities. As a central bank, it monopolizes the foreign exchange holdings of the PRC, operates the system of exchange control and lays down exchange rates against various currencies.[3]

A recent statement credited PRC financial stability to strong central control:

> The long-term stability of the renminbi is also due to the state's centralized and unified control of the issuing of notes through adjusting, in a planned way, the amounts of money put into circulation and to be called in. Issued by the state bank in a unified way and subject to its centralized control, the renminbi is the only currency in circulation in China.[4]

In contrast, in Chinese eyes the situation prevailing in the capitalist world is one characterized by "Monetary Markets in Chaos." [5]

In international financial circles, China is best known for its policies of "self-reliance." In their own words:

> Our country never relies on getting loans to solve the problem, still less on the issuing of more bank notes. Today, China is one of the few countries with neither internal nor external debts.[6]

This policy, however, is not considered inconsistent with the purchase of agricultural and nonagricultural commodities on "commercial credit" (12–24-month term) nor has it prevented China from purchasing complete plants on deferred, medium-term (5-year) repayment schedules—even when these involve explicit interest charges.[7] It should be emphasized, however, that use of credit is not a radical policy shift for the PRC. It accepted a substantial amount of credit from the Soviet Union in the 1950's. After that was paid off, the PRC engaged

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[2] William Triplett, "The Banking Industry," in William Whitson (Ed.) *Prospects for Trade With China,* (New York: Praeger Publishing Co., 1974), pp. 190–209.

[3] Anthony Richard Dicks, "The People's Republic of China," in Robert Starr (Ed.), *East-West Business Transactions,* (New York: Praeger Publishers Co., 1974), p. 397.

[4] Hsia Li-chih, "Striking Contrast Between Two Different Economic Systems," *Peking Review,* No. 48, Nov. 29, 1974, p. 29.

[5] ———, "Capitalist World: Monetary Markets in Chaos," *Peking Review,* No. 48, Nov. 29, 1974, p. 29.

[6] Hsia Li-chih, *op. cit.* p. 9.

[7] Wiegold, *op. cit.*

the Japanese in serious discussions about purchases on medium-term credit in the mid-1960's.[8]

Every indication is that China's official policy remains essentially conservative and that the PRC will not rely importantly on external finance. However, the PRC view may have moderated somewhat in the past few years. For example, Vice Premier Teng Hsiao-p'ing told one group that:

> We now also accept installment payment terms for machinery from abroad but only in the knowledge that we are capable of making regular payments. We must remain free from debts, both at home and abroad, and go not further than that.[9]

This language, in itself, represents only a small change but it does broaden the concept of "self-reliance" to include China's "payment capability." In the long run, this principle could turn out to be a shift of some significance if Chinese foreign trade enthusiasts successfully argue that PRC foreign trade potential could easily support significantly greater financial obligations.

Although small as a proportion of domestic economic activity, foreign trade plays an important role in Chinese economic planning. During periods of rapid industrial expansion, importation of advanced equipment and technology appears to play an important role in investment plans. Furthermore, imports are used to offset unplanned domestic shortages (e.g., grain and cotton imports). Thus, although foreign trade is small and a "residual factor," it plays an important economic role in that it partially immunizes planned domestic economic activity from unforeseen production shortfalls. In a tautly planned interdependent economy without self-adjusting market mechanisms, exogenous sources of supply are particularly important—but their importance depends on their dependability and rapidity of supply. In this regard, the remark of Soviet expert George Garvy is instructive: "there are very few things the Russians hate worse than uncertainty." [10]

II. PRC International Trade

China's international trade is comprehensively treated elsewhere in this volume.[11] This section will briefly discuss four aspects that are important from a financial point of view. These are: the size of China's foreign trade; its orientation toward non-Communist countries; the overall year-to-year current account balance; and the high degree of multilateralism of PRC trade.

By any measure, foreign trade occupies a minor role in overall PRC economic activity. Thus, a relatively small reallocation of domestic economic resources would have a very significant impact on the current account trade balance.

Ever since 1963 China's trade with non-Communist countries has accounted for the predominant part of PRC total trade turnover to the point where it now occupies 85 percent of the total. Thus, the great majority of PRC total trade involves commercial transactions with

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[8] Japan External Trade Organization (JETRO), *How To Approach the China Market,* (New York: John Wiley and Sons, 1972), p. 92.

[9] Teng Hsiao-p'ing, cited in David L. Denny, "China's Foreign Financial Liabilities," in *United States-China Business Review,* vol. 2, No. 1, January–February 1975, p. 34.

[10] George Garvy, *New York Times,* June 5, 1974.

[11] See the Article by Nai-Ruenn Chen, "China's Foreign Trade, 1950–74," in this volume.

private western businessmen. Financial aspects of this trade are handled by correspondent relationships between the Bank of China (BOC) and private Western banks. With few exceptions (see below) they are not subject to bilateral government-to-government clearing agreements. The practical implication of this is that the great majority of PRC trade utilizes trading and banking techniques that are familiar in the West. However, as shown below, the PRC takes advantage of its monopolistic position to gain the best financial provisions; thus, in some particular areas Chinese practices tend to be somewhat assymetric.

In its trade with non-Communist countries, the Chinese appear to have sought a reasonably close balance between total exports and imports in most years—at least until 1973. In 4 of the 5 years when the imbalance exceeded $100 million, imports (in current prices) were sharply cut back in the succeeding year. From 1950 through 1972, the PRC ran a cumulative hard currency commodity trade deficit with non-Communist countries that was roughly $1 billion.[12] Exchange earnings from remittances, invisible earnings (shipping, et cetera), and gold production are notoriously difficult to measure, but if the Usack-Batsavage estimate of $100 million annual remittance and $25 million annual gold production is roughly correct, China had a moderate surplus in its overall balance of payments.[13] Presumably such rough "back of the envelope" estimates are the source of a number of calculations that place China's foreign exchange reserves in a range from roughly $1 billion (with gold valued at official prices) to $4 billion (gold valued at market prices). Even if the lower end of the range is taken as more accurate, the PRC foreign reserve situation in late 1972 was conservative by most standards. Foreign exchange of $1 billion could have purchased more than 5 months and three months of imports from non-Communist countries in 1972 and 1973 respectively.

In comparison to other CPE's and even to Western economies, PRC international trade has a strikingly high degree of multilateralism.[14] An analysis (table 1) of PRC trade with 44 countries each of which traded at least $5 million with the PRC over the years 1969–73 indicates that PRC trade is far more multilateral than that of other CPE's. Even if the main source of PRC trade multilateralism (PRC trade with Hong Kong) is removed, PRC trade is still substantially more multilateral than either "West-West" or 'East-West" trade.

[12] *Ibid.* Table A–1.

[13] A. H. Usack and R. E. Batsavage, "The International Trade of the People's Republic of China," in Joint Economic Committee, *People's Republic of China: An Economic Assessment,* 1972, p. 342. Anthony Dicks, *op. cit.* p. 439 cities an estimate of $500 million per annum. The size of this figure, however, is very difficult to reconcile with China's foreign trade levels unless one is prepared to believe that foreign exchange reserves are a good deal higher than the range given in the text.

[14] "Multilateralism is a concept which refers to the freedom of a country to finance import surpluses with one set of trading partners with export surpluses with any other set." Paul A. Marer and Egon Neuberger, "Commercial Relations Between the United States and Eastern Europe: Options and Prospects," in Joint Economic Committee, *"Reorientation and Commercial Relations of the Economies of Eastern Europe," August 1974,* p. 578. As the authors point out the degree of multilateral financial balancing cannot be measured so the indexes all measure the degree of trade irreciprocity. If all trade were perfectly bilateral, exports would equal imports, there would be no surpluses and potentially no need for multilateral trade finance.

TABLE 1.—THE MULTILATERALISM OF PRC FOREIGN TRADE

	PRC 1969–73 (Including Hong Kong)	PRC 1969–73 (Excluding Hong Kong)	West to West	East-West
Paul Marer index	731	214	[1] 29	[1] 44
League of Nations index	67	41	[1] 17	[1] 19
Michaely index	41	27	[2] 29	

[1] 1968–71.
[2] 1954–58.
The indices and the estimates are analysed in the following articles:
(1) Michael Michaely, "Multilateral Balancing in International Trade," "American Economic Review," vol. 211, No. 4 September 1962, pp. 685–702.
(2) Paul Marer and Egon Neuberger, "Commercial Relations Between The United States And Eastern Europe," in U.S. Congress, Joint Economic Committee, "Reorientation and Commercial Relations of the Economies of Eastern Europe," (Washington, D.C.; U.S. Government Printi-g Office, 1974), pp. 578–581.
(3) Paul Marer, "Foreign Trade," in C. Beck and C. Mesa-Lago (editors), "Essays on Comparative Socialist Systems," Pittsburgh, 1974 (forthcoming), Appendices A-1 and B-1.
The source of the data for the PRC is: International Trade Analysis Division, Department of Commerce, "Imports and Exports of Free World Countries From (To) Communist Areas," value series, various years. The data is incomplete but wel over 90 percent of PRC trade is included.

The reasons for the high degree of multilateralism of PRC trade are twofold. First, there is the fact already mentioned that most of PRC trade is with non-Communist countries and is not subject to government-to-government trade and financial clearing arrangements. The other important factor is the unique demand for PRC goods in Hong Kong, Singapore, and other Southeast Asian countries with large urban-oriented Chinese populations. China plays the role of the economic hinterland serving the basic needs of the modern industrial and urban centers located on the coast. Such communities provide the PRC with large sources of hard currency but as yet have failed to develop industries whose products have much appeal to the PRC. These hard currency earnings are turned into pounds, francs, marks, dollars, and other currencies for settling China's substantial hard currency deficits with Japan, Oceanasia, Europe, and North America.

Because of PRC trade multilateralism and the importance of remittances, the PRC has had an incentive and even a necessity to master Western financial techniques. In this they are generally given high marks for technical competence but as is shown below it is notable that they have failed so far to experiment with the more sophisticated banking techniques of the bankers in other CPE's.

III. PRC International Financial Institutions

Overall responsibility for PRC international financial matters falls under the aegis of the People's Bank of China (PBC) which delegates responsibility for financial relationships with non-Communist countries to the Bank of China.[15] The Bank of China is a state-private joint corporation, 66 percent of whose capital is held by the government and whose General Manager, Chao P'ei-hsin, is a Deputy Director of the PBC. For most purposes, the Bank of China can be considered the foreign exchange bank of the PBC and is the organization with

[15] The information in this paragraph is based largely on Dicks, *op. cit.* pp. 397–99.

which most Western businessmen and bankers deal. Nevertheless, the PBC does have certain direct responsibilities in the area of foreign trade: it sets the rate of exchange of the renminbi (RMB—"People's currency"; it is also referred to as the yuan) against other currencies, operates the system of foreign exchange control—including releasing foreign exchange to the Bank of China according to the foreign trade plans, and it is responsible for the settlement of payment under bilateral agreements (see below) with other CPE's and a few smaller Western countries.

The Bank of China has branches throughout China and letters of credit opened by Western businessmen are often most expeditiously advised through these branches rather than through the head office. The BOC also has three overseas branches in Hong Kong, Singapore, and London. The first two are extremely important because these areas are sources of remittances, savings deposits, and of China's largest trade surpluses. The BOC's London branch is an important center for managing the PRC's hard currency portfolio, arranging for short-term commercial credit and facilitating what, if any, involvement China has had with the Eurocurrency market. The Hong Kong and Singapore BOC branches also monitor the affairs of the 11 PRC controlled banks in those cities.[16] In the last few years, these banks have been considerably more aggressive in soliciting deposits and have recently raised interest rates to make such deposits more attractive.[17] Such funds, of course, could be useful in the event of temporary foreign exchange shortages.

With Communist countries and with a few of their smaller trading partners, the Chinese set up bilateral clearing accounts through which all payments are made and received. Such arrangements are usually coordinated with annual trade agreements in which authorities on both sides agree on the desired trade levels and to some extent, at least, on the probable commodity breakdown of exports and imports. In a real sense, a bilateral clearing account agreement is a device to keep track of a complicated barter trade agreement where prices in one or more of the countries are artificial.

In bilateral clearing accounts the national banks of the two countries have mutual accounts through which payments for exports and imports are made. The accounts are denominated either in terms of the "trade ruble," commonly used to balance trade among East European countries, or in terms of a mutually agreed upon Western currency. The prices of the commodities agreed upon in the trade plan are generally determined by world market prices—although these prices may remain stable over a certain period of time. Recently, PRC trade with other socialist countries has been increasingly denominated in Western currencies (e.g., Swiss Francs), with world prices used to value transactions. The clearing account agreement generally forces the two countries to balance any trade imbalances bilaterally—usually by changing trade plans in the next period.

For example, in the PRC-Finnish agreement each country opened a non-interest-bearing account. The unit of account was the "trade ruble" which was stipulated to have a gold value of 0.987412 grams.

[16] Lewis, *op cit.* pp. 18–19.
[17] Paul Strauss, "China Boosts Sure of RMB Deposit Plan," *Journal of Commerce*, Nov. 5, 1974.

Debts may accumulate to the level of 1.8 million rubles, after which "the debtor country is requested to make the utmost effort to bring the amount within the framework of 1.8 million rubles as soon as possible." [18]

For settling financial aspects of trade contracts with non-Communist countries, the BOC maintains correspondent relationships with a large number of Western banks.[19] In general, the Western bank opens a renminbi account at the head office of the BOC in Peking and the BOC in turn opens a hard currency account with its correspondent. One published agreement specifies the maximum amount of RMB to be held by the foreign bank as "working balances." [20] Presumably "working balances" are non-interest-bearing although there has been one report to the contrary.[21] It is possible that this latter report refers to RMB deposits above and beyond "working balances" that have reportedly become increasingly important within the past year or so.[22]

The most interesting aspect of the rules concerning the accounts held by BOC correspondents involve the tight controls the BOC imposes over RMB purchases and sales. In general, all spot or forward purchases of RMB must be backed by references to a specific contract with a Chinese foreign trade corporation (FTC). For example, the agreement states that:

> A purchase of spot and forward RMB by the second party (a Western bank) from the first party (BOC) must be made against (a foreign currency) and is limited to payment of Chinese exports and relative charges on the basis of a Chinese export contract.[23]

In addition to RMB accounts held by correspondent banks, it is also possible for Western businessmen and tourists to open RMB accounts.[24] However, tightness of exchange controls would make any de facto trading in RMB extremely difficult if not impossible. Thus, while the RMB can be held by Westerners and can be converted (under certain conditions) into foreign currency, the RMB account is held within China and cannot be traded except between the foreign entity and the Bank of China. In short, even though China is unique among CPE's both in utilizing its own currency in international trade and allowing Western entities to hold accounts in RMB, the RMB is an untraded, inconvertible currency in most important respects.

Because of the still unresolved issues of blocked Chinese assets and private U.S. claims,[25] the Bank of China has not established a full-scale correspondent relationship with any U.S. bank and only accepts commercial letters of credit opened by approximately 30 designated

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[18] JETRO, *op. cit.* p. 16.

[19] There are more than 20 correspondent banks of the BOC in Japan. In the United States the BOC has correspondent relationships with about 30 branches of foreign banks (Wiegold, *op. cit.* and various issues of *United States-China Business Review*, vol. I). Because of the still unresolved fixed assets-private claims issue, the BOC has not established a full correspondent relationship with a U.S. bank. Nor does it maintain accounts at its correspondents located in the United States.

[20] See "Regulations Governing the Opening of Renminbi Account With the Bank of China, Head Office, Banking Department, Peking," reprinted in David L. Denny, "Recent Developments," *op. cit.* (cited hereafter as "Regulations").

[21] JETRO, chapter V, "The Method of Trade Settlement Between China and West European Countries," in *China's Economic Relations With the West* (translated from Japanese).

[22] Susumu Awanohara, "When Japan Deposits, China Borrows," *Far Eastern Economic Review*, June 17, 1974, p. 42. See below section 6 and footnote 48.

[23] "Regulations," *op. cit.*

[24] Nicholas H. Ludlow, "The Convertibility of the Renminbi," *United States-China Business Review*, vol. 1, No. 3, p. 33 and "How To Open a Bank Account in China," *United States-China Business Review*, vol. 1, No. 4, pp. 43–44.

[25] See the article in this volume by William W. Clarke and Martha Avery.

branches of foreign banks. This apparently has not significantly increased banking charges to U.S. businessmen since it appears that BOC correspondents have agreed to split banking fees with U.S. banks.[26] However, in some cases (particularly exports to the PRC), U.S. businessmen deal directly with the foreign bank designated by the BOC.

To some extent the reduced fees and the arm's-length relationship between U.S. banks and the BOC has surely lessened the interest and knowledge of U.S. banks in the China trade. Consequently their clients' attempts to do business with the PRC probably has been adversely affected to some degree.

The relationship between the BOC and Japanese banks is also unusual. Although there is no government-to-government clearing account agreement, the Japanese foreign exchange banks all follow the pattern of an agreement between the Bank of Tokyo and the Bank of China first signed in late 1972 and renewed in 1973.[27]

The key provisions of the agreement include the following: (1) the BOC and the Japanese banks maintain reciprocal accounts; (2) trade contracts can be denominated either in pounds, French francs, yen, or renminbi: the decision as to the denominating currency was primarily left to the importer; (3) surpluses on trade account were to be "converted into pound sterling and be drafted or transferred into a fixed deposit;" (4) the official exchange rates between the yen and RMB as well as between the pound and the RMB are set unilaterally by the Chinese; (5) the "official" exchange rate," however, was used only for interbank transactions. Japanese firms on the other hand, settled trade contracts according to the "yen-yuan actual value exchange rate" (or as it is usually called the "arbitrated rate"). The "arbitrated rate" was determined by a complicated formula including the RMB pound sterling official rate (set by China) and by market cross rates for the pound, U.S. dollar, and Japanese yen and; finally (6) the agreements did not permit Japanese firms to purchase forward RMB to protect themselves against exchange rate risk.

In practice, until recently the yen-yuan agreement has been weighted heavily in China's favor. Nearly all PRC import contracts and 80–90 percent of Japanese imports are quoted in RMB.[28] Japan enjoyed a substantial trade surplus from 1972 through 1974 and the Japanese suffered losses since their RMB accounts were converted into a steadily weakening pound sterling. Finally, on occasions, there were substantial differences between the "official" and the "arbitrated" yen-yuan rate. For example, on February 15, 1973, the arbitrated rate implied an effective 5-percent devaluation of the RMB from the official rate established by the People's bank.[29] On the surface, this meant

[26] Katherine Schwering, "Financing Imports From China," *United States-China Business Review*, vol. 1, No. 5, pp. 36–40.

[27] "Trade Settlement Between Japan and China," in *JETRO China Trade Newsletter*, No. 1, June 1973. See also, Ludlow, "Convertibility," *op. cit.* Information about the yen-yuan clearing agreements is scanty and sometimes confusing. A useful recent addition to the literature is Alistair Wrightman, "How Japan Finances Trade with China," *United States-China Business Review*, vol. 2, No. 2. Since the text of this section was completed, the Japanese succeeded in Spring, 1975 in getting the Chinese to be increasingly flexible on financial matters. The Chinese agreed to sell RMB forward to Japanese businessmen; Japanese RMB surpluses now can be converted to hard currencies other than pound sterling; and China became even more willing to denominate commercial transactions in currencies other than RMB.

[28] JETRO, "Trade Settlement," *op. cit.* p. 7.

[29] *Ibid.* p. 8.

that Japanese banks should have more RMB available to Japanese firms at cheaper prices (in terms of yen) than the price it was paying for RMB.

Notwithstanding the usually close relationship of official and arbitrated rates,[30] Japanese banks were unwilling to bear the exchange rate risks inherent in the yen-yuan agreement. Thus, "the Foreign Exchange Bank of Japan imposes this risk on Japanese training firms, which are compelled to bear the risk of the British pound and U.S. dollar to a certain degree in their transactions with China." [31] As will be emphasized below, the Chinese have recently been receptive to denominating both import and export contracts in yen or in third currencies. Moreover, it appears that the RMB-yen official exchange rate has recently been quite consistent with RMB rates for other countries (in comparison with world money market rates).[32] This would seem to imply that large divergences between "official" and "arbitrated" RMB-yen exchange rates are no longer possible. Finally, in the spring of 1975, the Japanese were successful in their repeated attempts to obtain forward cover for their RMB denominated contracts.

IV. Financial Aspects of PRC Contracts

China does not formally recognize the "Uniform Customs and Practice for Documentary Credits" of the International Chamber of Commerce, but its dealings with Western businessmen tend to follow these procedures and definitions nonetheless.[33]

The Chinese are known as hard and meticulous bargainers. Moreover, the Bank of China has an excellent reputation for its thoroughness and efficiency so businessmen are well advised to properly present all commercial documents agreed upon. Technicalities of PRC financial practices are discussed elsewhere [34]—only the important and unusual features will be discussed here.

Because of the Bank of China's position as the PRC foreign exchange bank and because of the Foreign Trade Corporations (FTC's) monopolistic controls over foreign trade transactions, PRC foreign trade contracts tend to be somewhat asymmetric. The FTC's normally purchase f.o.b. but sell c.i.f.; they tend to require that a Chinese inspection agency make final inspections for both imports and exports; somewhat less commercial documentation is proffered when China buys than when it sells; when possible the Chinese prefer a negotiated settlement of disputes, but if necessary, Chinese FTC's prefer to arbitrate before a Chinese arbitration tribunal although they have agreed

[30] According to the *Japan Economic Journal,* Aug. 14, 1973, p. 14, the arbitrated rate in 85 percent of all commercial transactions fell within 3 percent of the official rate.

[31] JETRO, "Trade Settlement," *op. cit.* p. 8.

[32] See below section 5; especially footnote No. 42. The average "broken cross rate" derived from the RMB-Yen official exchange rates for 50 days in October and November 1974 was only 0.3 percent. Since the "arbitrated rate" is based on a series of cross rates, the divergences in late 1974 were probably not as substantial as previously. However, Wrightman, *op. cit.* reports that this is still considered a problem of some importance by Japanese bankers.

[33] The "Uniform Customs" has been officially adhered to by the Soviet Union and other Eastern European countries. See I. Meznerics, *Law of Banking in East-West Trade,* Oceana Publications, Inc., Dobbs-Ferry, N.Y., 1973, pp. 149–151. The PRC (unlike other CPE's) does not adhere to other international conventions related to commercial transactions. Examples are: the Paris Union Industrial Property Rights Agreement and the Universal Copyright Convention.

[34] For more detailed discussions see David L. Denny and W. Graham Metson, Jr. "Financial Practices in United States-China Trade", *Overseas Business Reports* 74–64, U.S. Department of Commerce, and Schwering, "Financing Imports," *op. cit.*

to contract clauses naming Sweden, Switzerland, and Canada as sites for arbitration.

Both import and export letters of credit are irrevocable but PRC export contracts tend to call for unconfirmed and transferrable letters of credit. A further asymmetry is that both export and import letters of credit call for the documents to be "negotiated" [35] at a branch of the Bank of China in China. This leads to a short delay in payment which astute businessmen take account of in their contract negotiations. Chinese export contracts usually call for sight documentary letters of credit. In such cases, payment is made (in China) immediately after the FTC presents the required documents to the BOC. The implication of this is that the Chinese seldom, if ever, grant short term (30 days or more) commercial credit to their importers. Such credit is more common in Eastern Europe. Some of the socialist banks do discount time drafts and make commercial credit available to the Western importer in other ways.[36]

On the other hand, PRC import contracts often call for payment well beyond the date on which documents are negotiated. Exporting firms can obtain payment by discounting time drafts with their banks but until recently China has been unwilling to allow banks to "rediscount" PRC commercial paper in U.S. dollars on the U.S. money market. Now it appears that they have allowed their dollar-denominated commercial paper to circulate in the U.S. bankers' acceptance market.

For a fuller discussion of these problems the interested reader is referred to the previously cited works; but in general, these features do not seem to be significant impediments to business relationships with the PRC. Moreover, China's FTC's and the BOC are not inflexible. Naturally they desire to achieve the most favorable financial terms—but few, if any, of the above points characterize all FTC's for all commodities in all kinds of market situations. Businessmen should weigh their competitive situation and the time and energy that negotiations will take. There is no harm in making the best possible case for contractual modifications.

As a general rule, PRC imports (exports to China) are denominated and paid in Western currency. A major exception to this has been the case of Japan (see above) but because of the growing Japanese RMB surplus and the associated foreign exchange risks, a growing number of Japanese sales to China have been denominated and paid in yen or in some third country hard currency.[37]

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[35] Negotiation of documents refers to the process whereby a bank (usually in the seller's country) checks the seller's documentation (bills of lading, insurance certificates, etc.) before authorizing payment to the seller. For more details see the sources cited in footnote 33.

[36] A Hungarian official has written that "short-term credits granted to foreign purchasers entail a longer period of waiting (365 days at most). If the (Hungarian) exporter disposes of suitable, bankable, negotiable documents, covering goods sold on short-term credit, the National Bank of Hungary is willing—at the request of the enterprises—to discount the documents at preferential rates," I. Meznerics, *Law of Banking*, *op. cit.*, p. 57. In the case of the U.S.S.R.: "Credits are extended by the Bank for Foreign Trade of the Union of Soviet Socialist Republics (Vneshtorgbank of the U.S.S.R.) and by the Soviet Foreign Trade Organizations. In general, credits with maturation of up to 5 years are extended by the Soviet Foreign Trade Organizations while credits for longer maturities are extended by the Bank for Foreign Trade of the U.S.S.R." *Principle Conditions of Credits for Financing Soviet Exports* (Mimeo).

[37] Since late 1974, the following dollar denominated PRC import (from Japan) contracts have been reported: (a) 1.2 million tons of fertilizer, *Foreign Broadcast Information Service (FBIS)*, Feb. 19, 1975, p. A-7; (b) a $16.2 million truck import contract, *China Trade Report*, November 1974, p. 4; and (c) a $1 million sale of polyethelene, *Financial Times* (London), Feb. 5, 1975.

Particularly interesting is the fact that among the CPE's, China alone utilizes its own currency to denominate significant foreign trade contracts—particularly for PRC exports. Again this is by no means universally true; the case of the recent success of the Japanese in getting the Chinese to denominate PRC oil exports in U.S. dollars is a case in point.[38] Where the Chinese market position is relatively weak and where they are dealing in relatively homogeneous commodities (e.g., oils and minerals), for which there is a uniform worldwide market, they appear to be more willing to denominate export contracts in third currencies.

From the PRC point of view, export contracts denominated in RMB and China's control over the RMB exchange rate reduces China's exposure to fluctuation in the value of their trading partner's currency. In the late 1960's the PRC apparently suffered substantial losses due to pound sterling denominated contracts and the weakness of the pound.

On the other hand, the PRC system imposes the exchange rate risk upon the Western importer. The seriousness of such exposure is intensified due to the considerable time delay between contract signing and shipment and to shipping delays that have been fairly common in the past few years. At the current time the BOC offers RMB forward cover against 11 currencies. The cost of forward RMB is set by the BOC and varies from a low of 0.6 percent for 3 months to 3 percent for sterling and the French franc and 4 percent for lire.[39] The BOC does not provide forward RMB protection against the U.S. dollar. Furthermore, "the usefulness of this insurance is limited by the fact that the BOC approves cover on a contract by contract basis, sometimes refusing to grant forward contracts to specific firms or for products from certain countries." [40]

The importance of forward cover for the RMB, of course, depends on the degree of instability of the RMB exchange rate—a subject to be explored in the next section.

Finally, in view of the emphasis that the Chinese give to dealing with "old friends," it is somewhat surprising that the financial section of the contract almost invariably calls for payment by irrevocable letter of credit. Letters of credit still predominate in Western trade with the Soviet Union and with East European countries but in these countries there clearly is an increasing willingness to experiment with somewhat less costly (but more risky) procedures such as "cash against documents" and "open account." Also, the Chinese have seldom, if ever, engaged in barter-and-switch transactions so common in East Europe. Their policy of self-reliance has also all but ruled out a multitude of schemes aimed at longer term commitments such as coproduction, counterpurchase, joint ventures, and product payback.[41]

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[38] For one such report see *Japan Economic Journal*, Mar. 18, 1975, p. 6. Particularly noteworthy is the recent report that China has agreed to use German marks to denominate a contract for the sale of silk fabric to Japan. Wrightman, *op. cit.*

[39] "New Possibilities Emerge in Financing Trade With China," *Business International*, Feb. 28, 1975, p. 67.

[40] *Ibid.*

[41] For discussions of such arrangements see: I. Meznerics, *Law of Banking*, *op. cit.* pp. 228–31; "Trading with the U.S.S.R.," *Overseas Business Report 74–01*, U.S. Department of Commerce.

V. The RMB Exchange Rate

Until August 1974 the PRC established a single rate for both purchases and sales of RMB against Western currencies. Correspondent banks were notified of changes in the value of the RMB by cable. In mid-August, however, this system was replaced by publicly [42] announcing buying and selling rates for the RMB. The spread between buying and selling rates is one-half of 1 percent.

The intent of the PBC in establishing buying and selling rates is unclear. One possible explanation is that the Chinese could make a profit on the transaction and thereby increase foreign exchange reserves. This explanation is not entirely satisfactory, however, since RMB is usually not received by foreigners in exchange for PRC imports. One important exception, of course, is Japan—China's largest market. The divergence between buying and selling rates also could make Japanese bankers and businessmen marginally less anxious to reduce RMB deposits. Other explanations include a desire to reduce any incentive to buy and sell RMB deposits for speculative reasons and a desire to give the RMB an appearance similar to other world currencies. None of these explanations is entirely convincing.

The most important and interesting problem concerns the fluctuations in the RMB exchange rate. As already noted above, the absence (and, in some cases, the high cost) of forward RMB forces importers of PRC products to bear a foreign exchange rate risk. How great is that risk? Can the future value of the RMB be predicted—indeed, can we even make intelligent guesses about the principle the PBC uses in setting the exchange rate?

Table 2 presents the changes in the RMB value of nine currencies over 6-month periods roughly corresponding to the concluding dates of the Semiannual Chinese Export Commodities Fairs at Canton. As will be seen, negative and positive changes of 5 to 12 percent are common occurrences. Importers traditionally are averse to foreign exchange risk and many operate on relatively small margins. Thus, it can be concluded that the lack of forward facilities undoubtedly dampens some importers' ardor—certainly importers have, on many occasions, vigorously pressed Chinese FTC's and the BOC for some form of forward cover.

TABLE 2.—CHANGES IN THE RMB VALUE OF SELECTED WESTERN CURRENCIES [1]

[In percent]

Western currency	Time period: June to September 1972	September 1972 to May 15, 1973	May 15 to Nov. 15, 1973	Nov. 15, 1973 to May 16, 1974	May 16 to Nov. 15, 1974	Nov. 15, 1974 to Jan. 25, 1975
U.S. dollar	−2.20	−11.55	+0.76	−3.79	+1.65	−7.63
Japanese yen	+.64	+2.14	−5.06	−3.36	−6.07	−6.01
British pound	−7.99	−7.33	−6.24	−2.31	−3.31	−4.41
Swiss franc	0	+5.72	−.21	+6.04	+7.21	+2.09
German mark	+1.99	−1.24	+7.35	−.54	+1.31	−.05
Hong Kong dollar	−2.21	−.81	−.38	−4.33	+4.66	−2.16
French franc	0	0	+1.04	−12.18	+5.14	+1.99
Netherlands guilder	0	−2.39	+8.56	−.51	+.33	+.14
Italian lire	−2.00	−12.06	+.27	−10.00	−3.40	−3.82

[1] A "+" means an appreciation of the western currency and depreciation of the RMB.

[42] A convenient source of the RMB-U.S. dollar exchange rate is *United States-China Business Review*, (published 6 times a year). The Weekly Hong Kong magazine *Ching-chi Tao-pao* (economic newsletter) publishes the RMB exchange rates for 15 currencies.

The cross rates[43] implicit in RMB quotations are very close to world market rates. Daily RMB quotations for 14 currencies for October and November were compared with New York rates of the preceding date.

On rare occasions, there are "broken cross rates" in excess of 2 percent but broken cross rates in excess of 1 percent are unusual. In fact, the average broken cross rate was substantially below 1 percent. Although a more comprehensive comparison remains to be done, the RMB cross rates appear more consistent than those of the Soviet ruble. This is partly because even when they are established, the broken cross rates for the Ruble exceed two per cent fairly frequently. More importantly, the official value of the Ruble remains unchanged for significant periods while the Chinese change the value of their currency constantly to reflect world monetary conditions. In one sense, this is not surprising since the ruble exchange rate is used primarily for tourist transactions. On the other hand, given the PBC's complete control over the RMB, it is somewhat surprising that such care is taken to maintain consistent sets of exchange rates.

The principle underlying the valuation of the RMB remains a puzzle. Occasionally, Chinese officials have hinted that some kind of a currency basket approach is utilized and one report suggested that commodities of some sort may be included in the basket. At any rate, analyses to date have been unable to come up with a plausible basket—a task made difficult, of course, by the possibility that the weights in the basket may be changed from period to period.

Table 2 and figures 1 and 2, however, do permit some preliminary conclusions. In general, the Chinese seem to react passively to day-to-day world monetary conditions in adjusting the value of their currency over the short term.[44] As suggested above, they seldom permit a broken cross rate in excess of 1 percent which suggests that when the break in cross rates crosses a threshold of between 1 and 2 percent it triggers an exchange rate change. In general, they appreciate against weak currencies (e.g., the U.S. dollar in the first part of 1973 and in late 1974), on the other hand they depreciate against strong currencies such as the Swiss franc and German mark.

Both from table 2 and figures 1 and 2, it is clear that appreciations and devaluations are, to some extent, offsetting but it is difficult to come up with a combination that would provide a plausible currency basket. In fact, table 2 and figures 1 and 2 suggest that the value of the RMB may appreciate slowly over time. Except for the nearly universal declines in the value of the RMB in the second half of 1974, appreciation of the RMB are significantly greater in number and in size than devaluations. This tentative conclusion needs to be examined

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[43] A "cross rate" can be derived from the RMB exchange rate quotations for any two currencies. For example, if 1 RMB equals 50 U.S. cents and one-quarter of a U.K. pound, it would imply that the pound is worth 0.50/0.25 or 2 U.S. dollars. This can be compared to the world market rate for consistency. One measure of consistency is the "percentage break in cross rates". Mathematically this is defined as:

$$\frac{\text{Cross Rates (derived from RMB quotations)}}{\text{Market Rates}} - 1$$

The average break in cross rates were calculated for 14 currencies for a 2-month period (October and November 1974). The averages varied from a low of three-tenths of 1 percent to a high of 1.1 percent.

[44] For a similar conclusion see the discussion of the Renminbi in *Spotlight* (Published by Bank of America, Hong Kong), May 1974: "Financial circles greeted these incremental adjustments with no surprise, since for a year now China has realistically pegged the Renminbi to world monetary levels."

Figure 1

The Value of The Renminbi in Relation to Selected Currencies (1973)

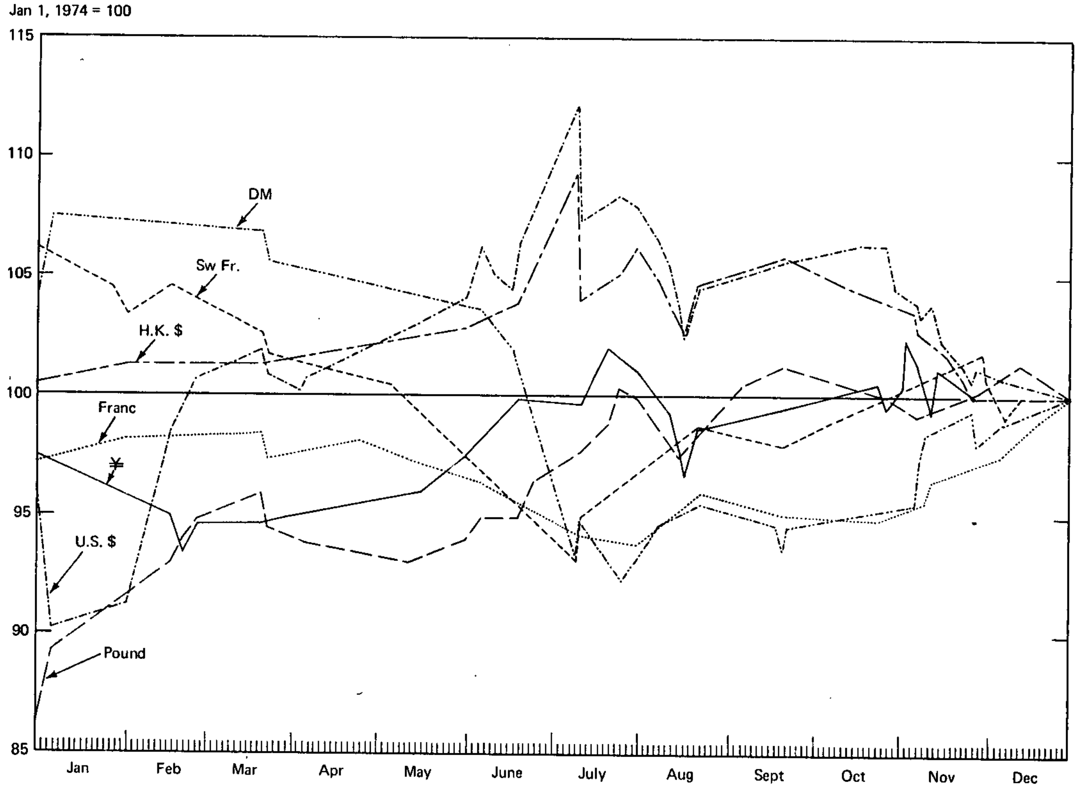
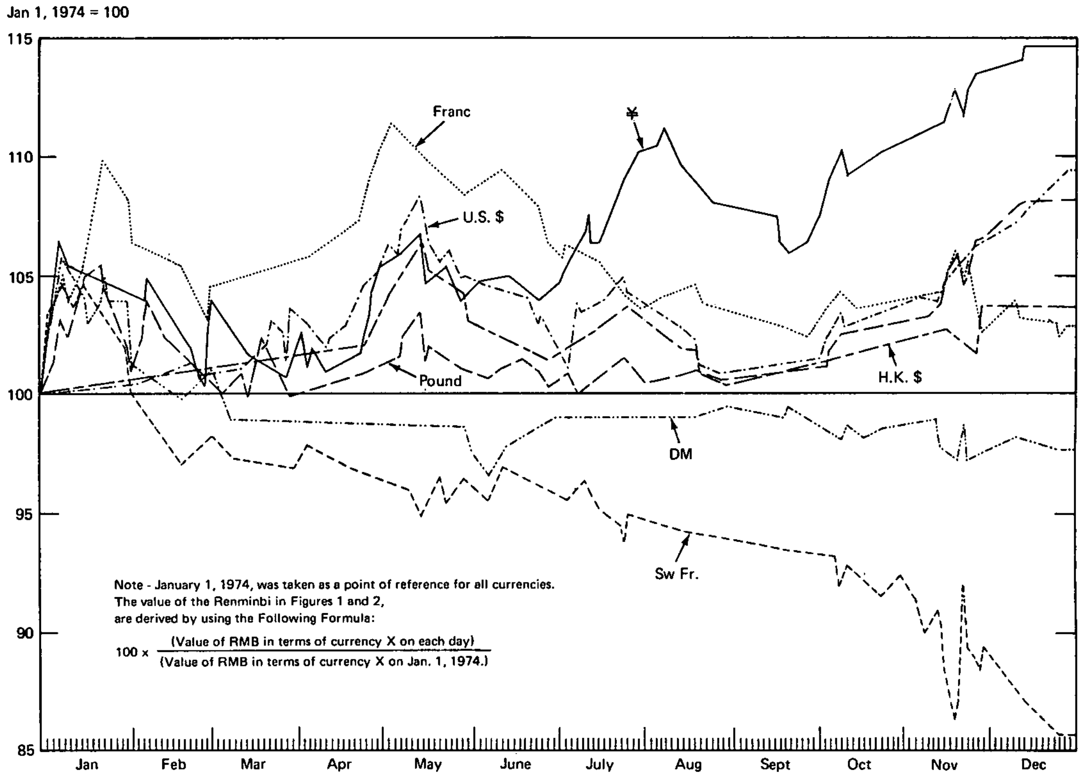


Figure 2

The Value of the Renminbi in Relation to Selected Currencies (1974)



in much greater detail but if it turns out to be correct, more sophisticated hypothesis than the simple currency basket need to be explored. The basket could be expanded to include a time trend, commodity price indexes, and other variables.

Alternatively, the value of the RMB may not be tied to a group of currencies but to one single currency. In certain extended periods of time the value of the RMB has remained unchanged relative to the Hong Kong dollar, the German mark, and, recently, the Netherlands guilder.

A closely related possibility is that except for the latter part of 1973, the Chinese may have kept the value of the RMB close to the so-called European "snake" whose currencies, in general, show little change with respect to the RMB. [45]

Over the 2-year period as a whole, the value of the RMB has also remained relatively stable (despite many individual changes) in terms of the Hong Kong dollar. Such a policy might be motivated by a desire to stabilize the cost of necessities for Hong Kong consumers and to emphasize the safety of RMB denominated savings deposits in Hong Kong banks.

Further speculation about the RMB exchange rate setting mechanism, however, must await more data and, more importantly, the application of more sophisticated analytical techniques.

VI. PRC Future Financial Obligations [46]

PRC future financial obligations take four forms. First, China purchases grain and other agricultural commodities on short term (up to 24 months) commercial credit. When PRC grain purchases (and grain prices) are stable, financial repayments also remain stable (5–6 million tons a year at current prices would imply annual financial obligations of approximately $700 million); however, the substantial imports following the poor 1972 harvest suggest that repayments will be significantly higher (perhaps $1 billion a year) from 1974 through 1976. Secondly, the PRC has recently purchased more than $2 billion worth of complete plant and equipment most of which will be paid for in installments reaching into the 1980's. Under one formula (progress payments) the PRC pays for the plant as it is being installed, with final payment coming when start-up is made and guarantees are met. This practice is normal for such purchases and in a technical sense does not involve a PRC indebtedness—nevertheless it will eventually result in a future PRC repayment obligation. Under the second formula (deferred payments), about 80 percent of the projects are financed by institutions such as the Japan Eximbank. The repayments are spread over 5 years; the repayments commence only after the plant has been completed and an interest charge (usually 6 percent or so) is applied to the outstanding principal. Third, the Chinese have recently begun purchasing machinery and equipment on "deferred pay-

[45] The European "snake" refers to the arrangement of many European countries to limit fluctuations among their own currencies. However, this group of currencies floated against the other major currencies. The countries comprising the "snake" were Germany, Denmark, Norway, Netherlands, and Belgium. France and Italy were also part of the snake until early 1974.

[46] For a fuller treatment of some of these issues see David L. Denny, "China's Foreign Financial Liabilities," *United States-China Business Review*, vol. 2, No. 1, pp. 34–38. The article contains a list of the complete plants the PRC has purchased on "progress payments" and "deferred payments".

ments" basis.[47] So far, such purchases seem relatively small in magnitude. Finally, the PRC has reportedly begun to accept hard currency interest-bearing deposits at the BOC in addition to the aforementioned obligations of PRC controlled banks to depositors in Hong Kong and Singapore.[48] Since the hard currency deficit on trade account for 1973 and 1974 is likely to be around $1.3 billion, a ceiling on this kind of PRC short-term borrowing might be placed at $1 billion.

By any standard, PRC financial obligations appear to be small relative to most CPE's. Even if all of the above obligations are considered as analogous to "debt," the total would only reach $4.5 billion—approximately as much as China's estimated hard currency exports in 1974.[49] This 1:1 ratio would be smaller than the average "debt" hard currency: export ratio (1.35) for the Soviet Union and Eastern Europe. It would be considerably less than the 1.77 and 2.51 ratios registered in the Soviet Union and Bulgaria respectively.[50] Moreover, this comparison exaggerates the size of PRC future financial obligations for a number of reasons. First, drawings on loans made available by institutions (e.g., Japan's Eximbank) supporting complete plant sales have only begun. Perhaps even more importantly, it is not clear that "supplier credits" should even be included in such calculations since they are more analogous to long-term commitments to pay for products as they arrive in China. To the extent that they have occurred, future obligations deriving from such supplier credits have not been included in the other debt: export ratios cited above. Finally, adding the PRC trade current account deficit to the short-term commercial debt to pay for grain involves some double counting since grain imports were a major cause of the trade deficit.

Another useful measure of "credit worthiness" is a country's annual repayment of principal and interest as a share of hard currency export earnings. This ratio is somewhat less than 20 percent in the U.S.S.R.[51] and a good deal higher in some other East European countries.[52] As a rough rule of thumb, a 25 percent repayment ratio is often taken as an indication of potential repayment problems.[53]

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[47] "Steel Industry Plans To Give China 150-Day Usance for December Shipments," *Japan Economic Journal,* Jan. 14, 1975, p. 4. The article goes on to state that "such a long deferred payment for China this time is a very rare case in Japan's steel trade." It was linked to "facilitating" China's payment "in view of the recent deterioration of China's foreign exchange reserve."

[48] Wiegold, *op. cit.* "(the Bank of China) has been accepting short- and medium-term deposits from Japanese and European banks, Mr. Saubelle disclosed." See also *Japan Economic Journal,* Jan. 15, 1974; Dick Wilson, "The BOC's Expanding Role." *op. cit.;* and Susumu Awanohara, "When Japan Deposits." *op cit.* Mr. Wilson quotes a *Financial Times* report that British banks have deposited $250 million and speculates that $500 million might be used as a global total. Colina MacDougall, ("Peking Feels the Pinch." *Financial Times,* Feb. 26, 1975), puts the total at "perhaps $500 million to $1 billion at any one time."

[49] The $4.5 billion estimate is composed of roughly $2 billion for complete plants already purchased, $1.25 billion for outstanding agricultural credits, and $1.25 billion for bank and other credits accepted (primarily in the last 2 years) to cover the growing imbalance between imports and exports. As emphasized below, these figures are not entirely comparable to such estimates for other CPE's. Nor has it been possible to obtain complete information on other sources of China's outstanding obligations. These estimates, then, must be used with caution and viewed as preliminary. Despite these qualifications, only extremely wide margins of error would undermine the basic conclusion that China's outstanding financial obligations are small relative to other CPE's and do not appear to strain China's ability to meet their obligations.

[50] Dr. Lawrence J. Brainard, "Criteria for Financing East-West Trade," in John P. Hardt (ed.), *Commercial and Legal Problems in East-West Trade,* (Ottawa, Canada: Carleton University, forthcoming).

[51] Central Intelligence Agency, *U.S.S.R.: Long-Range Prospects for Hard Currency Trade, a Research Aid,* January 1975, p. 2.

[52] Paul Marer, "Indebtedness, Credit Policies and New Sources of Financing," Carl H. McMillan (Ed.), *Changing Perspectives in East-West Commerce,* (Lexington Books, D. C. Heath and Co., Lexington, Mass.), p. 130.

[53] *Ibid.*

Because of the scarcity of data on the possible magnitude of recent PRC financial liabilities to banks and on the Eurocurrency market and because of the inclusion of plants purchased by means of progress payments, interpretation of the future repayments schedule for the PRC is difficult. Nevertheless, even assuming worst possible scenarios, the PRC repayment schedule still seems moderate.

Table 3 (column 1) presents the repayment schedule for all known complete plants for which the PRC has recently contracted. It also assumes (column 4) that in the rest of the 1970's, the PRC will purchase annually $700 million worth of wheat (about 5.5 million tons) on short-term credits. Such repayments amount to about $1.3 billion annually in 1975 and 1976. Unless hard currency exports grow at a rate substantially in excess of 10 percent, the repayments will be between 20 and 25 percent of exports in those years. If the PRC is also planning to reduce liabilities to foreign banks, the repayment ratio might even exceed 30 percent. Thus, in terms of the traditional measures, it is easy to see why the last months of 1974 brought so many reports of PRC short-run foreign exchange reserve problems.

TABLE 3.—PROJECTED PRC REPAYMENT SCHEDULE, 1975–82

	Payments for complete plants already contracted for as of Dec. 31, 1974	Payments made assuming PRC continues to purchase $1,000,000,000 yearly, medium term financing	Subtotal (1) and (2)	Payments for agricultural products	Grand total
	(1)	(2)	(3)	(4)	(5)
1975	275.7	200.0	457.5	1,000	1,457.5
1976	340.0	200.0	540.0	1,000	1,540.0
1977	358.1	200.0	558.1	700	1,258.1
1978	370.3	416.0	786.3	700	1,486.3
1979	259.6	620.8	880.4	700	1,580.4
1980	218.0	814.4	1,032.4	700	1,732.4
1981	146.9	996.8	1,143.7	700	1,843.7
1982	103.0	1,168.0	1,271.0	700	1,971.0

Col. 1—Form information in table 1. For additional details see: U.S. Government, "International Trade Handbook," October 1974; "U.S. China Business Review" (various issues): and Hans Heymann "Chinese Approaches to Technological Acquisition," pt. III, "Summary Observations," September, 1974, a forthcoming Rand Corporation Report.

Col. 2—In addition to the assumption that China continues to purchase $1,000,000,000 annually, the following assumptions are made; (a) China makes 20 percent down payments ($200,000,000), (b) the remainder is financed over 5 yr at 7 percent, and (c) the projects are completed 2 years after the contracts are signed.

Col. 4—Table 2 assumes that China purchases most or all grain on 12 to 18 mo. terms 5,500,000 tons at $120 per ton the value would total about $660,000,000 annually. The financial arrangements vary but all stipulate a certain down payment with the remainder paid at 6, 12, 18, and 24 months intervals.

Note on repayments calculations—Yearly repayment figures are based on constant interest rate on remaining amount of principal.

Source: Reprinted from David L. Denny, "China's Foreign Financial Liabilities," "United States-China Business Review". vol. 2. No. 1, p. 37.

In the longer run, the current levels of Chinese financial repayments do not appear to be very heavy. Assuming that wheat imports return to the level of the 1960's and that the PRC does not purchase additional plants, annual repayments would amount to about $1 billion—a figure that should be well below 15 percent of hard currency exports in the late 1970's. Moreover, it should be emphasized again that inclusion of repayment for plants purchased on progress payments tends to overstate PRC financial obligations since, in the traditional framework, such payments are not, strictly speaking, a repayment of debt.

Finally, column 2 in table 3 presents a repayments schedule on the assumption that the PRC will continue to purchase $1 billion worth of complete plant annually on deferred payments. This assumption is purely a hypothetical device to explore the question of such a program's implication for China's future financial obligation. Its hypothetical nature, in fact, has been highlighted by the near complete hiatus in purchases of complete plants since spring 1974. Moreover, the few plants purchased since spring 1974 were apparently designed to supplement larger complexes previously contracted for. As I have stated elsewhere, such an import program would not appear to lead to prohibitive repayment obligations: "a 20-percent repayment ratio might be maintained by a quite reasonable export growth (in current prices) of about 12 percent per year."[54] The fact that the PRC has not continued to purchase new complete plants and even cut back sharply on scheduled imports is an indication "that PRC foreign trade policy continues to contain a cautious attitude toward expanding its future financial liabilities in relation to its export potential."[55]

In addition to the methodological problems of comparing PRC financial obligations with those of other countries, it should be emphasized that such ratios are themselves only one aspect of a country's creditworthiness. As Brainard has written:

> Lending is an art not a science * * * it is the future ability and willingness of the borrower to meet debt obligations that must be forecast * * * (and) economics has yet to provide any theory of a country's capacity to service external debt.[56]

In the last analysis bankers and creditor nations want to know the degree to which the debtor nation is able to utilize resources efficiently as well as its economic and political commitment to make future resources available to service its financial obligations.

In addition to debt export and debt service ratios, many other quantitative and qualitative factors must be considered. First, a country's previous repayment history is, of course, extremely important. Like other socialist countries,[57] the PRC's repayment record has been excellent. The repayment record of CPE's has so far apparently led bankers to place less emphasis on the quantity and quality of information about foreign exchange reserves, balance of payments, and other elements that banks usually require. However, this easier attitude may be changing due to the uncertainties created by the unstable world monetary situation in the mid-1970's. Before major amounts of private credit can be raised for East European CPE's, Brainard has argued that those countries would have to be more forthcoming "not only * * * about the country's balance of payments, indebtedness, and international liquidity position but more importantly about the uses to which prospective borrowings are to be put."[58] In this regard, the information made available today by the PRC clearly falls short of that provided by other CPE's but the "information gap" has not yet seemed to be an impediment to the PRC's limited use of external finance.

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[54] Denny, "China's Foreign Financial Liabilities," *op. cit.* p. 38.
[55] *Ibid.*
[56] Brainard, "Criteria," *op. cit.*
[57] Recently there have been reports of possible defaults by North Korea. If this actually comes about, it will be interesting to note the financial community's appraisal of the creditworthiness of the other CPE's.
[58] Brainard, "Criteria," *op. cit.* p. 30.

Another set of important considerations has to do with the size of a country's foreign trade sector and the degree of effective control exerted by central planners. The PRC foreign trade sector, as previously mentioned, occupies only a very small percentage of total national product and is completely monopolized by a handful of Foreign Trade Corporations. Undoubtedly, domestic economic and political considerations are such that foreign trade planners cannot arbitrarily change exports and imports to achieve a balance in PRC international payments. Nevertheless, historically the PRC has been able to respond quickly to large trade imbalances by reducing imports, increasing exports, or both. In late 1974, cancellations and deferments of scheduled imports as well as a slowdown in new orders, suggest that this strategy is being followed again.

Finally, as in all types of lending activity, the ultimate question is the borrower's ability to pay—or in this case the ability to efficiently utilize resources to increase exports to meet financial obligations. This ultimately leads to the question of the future growth of the PRC economy and of its foreign trade sector—subjects much too complex to be discussed in any detail here. Other papers in this volume describe the economic performance of the first 25 years—a performance that varied widely from period to period but which was moderately impressive overall in relation to other less developed countries. The PRC's ability and willingness to increase exports cannot be determined definitely at this time. What has been observed recently, is an apparent increase of resources in learning about Western markets and small but important steps in the direction of greater flexibility on matters of style, labeling, and packaging.

In addition to its relatively low external financial obligation, the PRC approach is conservative in other ways as well. First, much of PRC purchases are financed directly and indirectly by credits extended to the suppliers. Undoubtedly the good reputation of the PRC in fulfilling contractual obligations helps its suppliers obtain credit on favorable terms. However, on a priori grounds one would expect that credit would be cheaper if it were given directly to a national institution backed by the full faith of the government. In this regard, the conclusion of a Hungarian banking expert is instructive:

> At first sight, direct supplier's credits may appear advantageous for the importer, primarily owing to a lower interest rate. In some cases such credits may be granted free of interest. Nevertheless, the economic advantage involved by these credits is usually only an illusion, since the exporter evidently includes in the calculated price the expenses incurred in the course of the financing operation and charged to him by his bank. Again, since the conditions of credits granted by the banks to their customers are—as a rule—harder than conditions applying between banks themselves, credit extended directly by the exporter is—in spite of its appearance—more expensive than bank credit.[59]

Second, the Chinese financial obligations involve only short- and medium-term credits. At this writing, the PRC has been unwilling to finance purchases by long-term arrangements of any kind unlike the Soviet Union where "reportedly as much as 90 percent is in this category." [60] If the PRC foresees a continuation of worldwide inflationary pressures, such a conclusion might lead them in the direction of long-term credits—but acceptance of such credits would be a dramatic move

[59] I. Meznerics. Law of Banking, *op. cit.* p. 59.
[60] Marer, "Indebtedness," *op. cit.* p. 130. This explains why the "repayment schedule approach" is more unfavorable to the PRC than the "debt-export approach."

and might encounter domestic resistance on political and ideological grounds.

Third, there is a whole range of relationships between Western companies and CPE countries with which the PRC has yet to experiment. These include Western investments in return for long-term coproduction schemes and, in a few cases, willingness to permit Western companies to purchase equity in CPE enterprises. As is emphasized elsewhere in this volume,[61] the PRC is strongly opposed to such arrangements at this time. Moreover, its balance of payments position and its creditworthiness seem to preclude any real need to pursue such arrangements. The most interesting possible exception would involve a dramatic PRC decision to develop oil and natural resources on a very large scale. However, to date the obvious interest of Western oil companies has gone unreciprocated on the Chinese side.

Finally, the banking sectors of other CPE's—particularly that of the Soviet Union—have increasingly begun to participate as conventional international bankers. These countries have established wholly or partly owned banks in Europe and other countries to handle short- and medium-term trade finance (not limiting themselves to the trade of their own countries), to accept hard currency deposits and to participate as borrowers and lenders on the Eurocurrency market. In some cases, Eastern European countries have even sold their own bonds on Western markets. So far the Chinese have shown little desire to match the sophistication of the other CPE's at such "bourgeois" banking practices.

VII. Membership in the International Monetary Fund and in the World Bank

In 1973 a communication from the PRC to the International Monetary Fund (IMF) set off a flurry of speculation that China wanted to participate in the Fund.[62] The official position of the IMF, however, suggests that this interpretation of PRC intentions was premature:[63]

> The managing director of the Fund received a communication from the PRC regarding the representation of China in the Fund and the International Bank for Reconstruction and Development (World Bank). The communication was considered the following month by the executive boards of both the Fund and the Bank, which decided to postpone action on the request pending clarification by the People's Republic of China.

In this regard, it is useful to note that an earlier communication from the Chinese Government had been received that "challenged the credentials of the governor for China on the ground that the Republic of China lacked the authority to appoint a governor" * * * (and emphasized that the Peoples' Republic of China) "was the sole legal government and that other delegates were not qualified to participate on behalf of China in the meeting and organs of the Fund."[64]

The primary benefits of membership in the IMF and the World Bank are the access members have to short-and long-term loans. The IMF

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[61] See the article by William Clarke and Martha Avery in this volume.

[62] *New York Times*, Sept. 29, 1973, p. 43. Leo Goodstadt, "IMF: A Place for China," *Far Eastern Economic Review*, Oct. 8, 1973, pp. 47–48.

[63] *United Nations Yearbook, 1973.*

[64] Joseph Gold, *Membership and Nonmembership in the International Monetary Fund*, (Washington: International Monetary Fund, 1974), p. 67.

grants loans that allow members to temporarily maintain the par value of their currencies as long as such loans are not used to ward off long-term fundamental disequilibria. The World Bank makes loans for economic development related projects both at interest rates comparable to world market levels and "soft loans" on substantially easier terms. IMF membership is a necessary condition for belonging to the World Bank.

Under current Chinese policy, it seems unlikely that membership in the two organizations would be sought for the purposes of obtaining loans, but the possibility cannot be excluded for the future. In 1945, China's original IMF capital quota was set at $550 million (U.S.) which made it the fifth largest member.[65] Since that time, nearly all capital quotas have been raised substantially. A rough estimate of a possible present capital quota (should China join) might be in the neighborhood of $1 billion (Japan's quota is $1.2 billion and India's is $940 million).[66] Such a quota would allow China to borrow $250 million of hard currency (the so-called first gold tranche) on demand. Additional borrowings could be arranged but on more restrictive terms.

By membership in the IMF China would become eligible for World Bank membership. In 1973–74, the World Bank made loans to Asian countries totaling $1.4 billion; India's share was $442 million.[67] The Bank's current emphasis on developing agricultural regions in poor countries would be consistent with China's own strategy of placing priority on agricultural development. The Bank, it should be noted, has recently made two loans totaling $130 million to Romania for a fertilizer and a steel plant.[68]

Should the Chinese seek membership, a number of difficult problems would have to be faced—principally, IMF information requirements; IMF "convertibility" requirements; and the capital quota.

The "minimum necessary" economic information requirements for IMF membership include: official foreign exchange holdings, gold production, total exports and imports in terms of local currency values, trade figures broken down by country of destination and origin, information on the balance of payments including capital flows and invisibles, national income, price indexes, and foreign debt.[69] Such information is considered necessary for the IMF to carry out its basic role of monitoring exchange rates and providing satisfactory mechanisms for changes in the par value of any member's currency. But, as emphasized elsewhere in this volume, the current economic information on the Chinese economy falls very far short of these criteria.[70]

On the issue of convertibility, the Fund distinguishes between article 8 and article 14 countries.[71] The currencies of article 8 countries are, in theory, convertible in the fullest senseof being available for purchase and sale against other currencies for purposes of current transactions. Discriminating currency and multiple-currency arrangements are prohibited. Ideally, not only is an article 8 country's currency exchangeable for other currencies, it may also be used freely to make

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[65] *Ibid.* p. 15.
[66] *Ibid.* p. 146.
[67] World Bank, *Annual Report,* 1974, p. 9.
[68] *Ibid.* p. 14.
[69] *Ibid.* pp. 567–68.
[70] Nai-Ruenn Chen, "An Assessment of Chinese Economic Data: Availability, Reliability and Usability."
[71] The IMF Articles of Agreement are reprinted in Joseph Gold, *op. cit.* pp. 553–638.

current (but not necessarily capital) purchases. The Fund recognizes, however, that many countries cannot or will not immediately make their currencies fully convertible and use various methods to restrict currency transactions. Such countries are subject to a "transitional period" defined in article 14 and must consult with the IMF annually on further retention of such practices. The Fund may "make representations to any members." [72] in an attempt to remove such restrictions.

A strict interpretation of IMF regulations would make it difficult for any CPE including China to join the IMF. Franklin Holtzman describes the problem as follows:

> The distinctive feature of the Communist problem is not currency inconvertibility but what has been called commodity inconvertibility. Currency inconvertibility is the garden variety capitalist disease and can be cured (temporarily at least) by devaluation. This is not the case with commodity inconvertibility. As we noted, the exchange rate is not a real price in case of countries which suffer from commodity inconvertibility—hence devaluation is meaningless and has no effect on trade; trade is conducted at world prices regardless of domestic prices and official exchange rates.[73]

But as the Fund's General Counsel, Joseph Gold has emphasized:

> There can be no doubt that the architects of the Fund contemplated a place within the structure for countries with state-controlled economies. The U.S.S.R. attended the Bretton Woods conference and various issues its delegates raised there and in earlier discussions led to the incorporation of some provisions and affected the drafting of others in order to make it easier for the U.S.S.R. to take up membership.[74]

Nevertheless, as he himself has written, "it is not clear how the drafters of the articles reconciled membership for countries with state-controlled economies with all the obligations of membership." [75] While the admission of CPE's into the IMF does not pose insurmountable problems (Romania joined in December 1972), there remain serious questions about the reconciliation of IMF goals with the present economic structure of CPE's. Again it is worthwhile to quote Joseph Gold at length:

> The admission of countries with state-controlled economies does not imply that in consultation with them the Fund will refrain from urging that they will benefit from the reduction and eventual elimination of discrimination, bilateralism, multiple rates of exchange and other practices incompatible with the purposes of the Fund. This advice is tempered with patience and throughout extensive periods the Fund may go on approving practices that are inconsistent with the articles unless approved.[76]

As we have concluded in section 3, the RMB is only convertible in the narrow sense of being offered for sale if a purchaser of PRC goods has a contract for which he can prove a need for RMB. Presumably, the Chinese would also be able to meet the IMF requirement which requires a country to repurchase any of its own surplus currency held by another country (using either gold or currency of the other country). However, as in other CPE's the full jump to allowing foreigners to purchase RMB to use freely in purchasing from Chinese enterprises would strike at the very heart of the separation of foreign trade and

[72] *Ibid.* p. 579.
[73] Franklin D. Holtzman, "East-West Trade and Investment Policy Issues: Past and Future," in Joint Economic Committee, *Soviet Economic Propects for the Seventies,* June 27, 1973, p. 683.
[74] Joseph Gold, "Membership in the Fund," *Finance and Development,* vol. 12, No. 1, March 1975, p. 44.
[75] *Ibid.*
[76] Gold, *Membership and Nonmembership, op. cit.* p. 143.

domestic economic activity. There is no indication that Chinese planners have even begun to experiment with giving their enterprises the same degree of flexibility in foreign trade as in Hungary and some other CPE's.[77]

Finally, assuming that China was assigned a quota of $1 billion, at least 75 percent could be paid in the Chinese currency—RMB. Originally, IMF requirements required at least 25 percent of the quota (or 10 percent of net official gold and dollar holdings) to be paid in gold. Recently this requirement has been moderated:

> The fund has insisted on the subscription of some gold, although sometimes only in symbolic amounts, until 1973 when it considered an application by a country that held no gold and could not obtain it from official sources.[78]

In conclusion, given the uncertainty about the future shape of the world monetary system and our lack of knowledge about China's intentions, it is difficult to assess the possibility of future PRC membership in the IMF and World Bank. About all that can be said with assurance is that the IMF's attitude about relationships with CPE's is one of cautious ambiguity. Again we quote from Joseph Gold:

> It is legitimate to conclude that the Fund has applied its criteria for membership with flexibility and has been guided by an unformulated policy of readiness to accept as wide a membership as possible.[79]

Conclusion

China's practices in financing trade with non-Communist countries are in substantial contrast to those of the other CPE's.

Despite the fact that the PRC has a greater share of its trade with the West than other CPE's, the PRC has been more reluctant to adopt as many Western banking practices as the other CPE's. Many of the practices that have been adopted have been modified with the general result that the PRC maintains somewhat more control over its international finance with the West than other CPE's do. Examples of this range from requiring negotiation of letters of credit in China both for exports and imports to using the renminbi to denominate trade contracts.

Most importantly, the PRC has, as yet, been unwilling to follow other CPE's in adopting Western banking techniques such as setting up European branches to engage in archetypical banking activities such as general trade financing and active participation on the Eurocurrency market.

On the other hand, PRC international financial practices have changed in the last few years—generally in the direction of adopting more "traditional" practices. The Chinese FTC's have been more flexible on various letter of credit provisions and they have become more willing to denominate trade contracts in Western currencies. Most important of all, of course, the PRC has begun to accept credit, albeit in moderation and often indirectly.

Whether these add up to significant steps toward substantially more aggressive and more traditional international financial activities is

[77] Marer and Neuberger, *op. cit.* pp. 572–73
[78] Gold, "Membership in the Fund," *op cit.* p. 44.
[79] *Ibid.*

much more problematical. Recent events may be short-run adaptations to unexpected foreign trade deficits (i.e., the large agricultural purchases following the poor 1972 harvest) or to one-shot purchases of capital equipment. On the other hand, they may portend a more far-reaching change. The conclusion depends on one's view about China's future emphasis on foreign trade and the policymakers' views about how much foreign equipment will be needed to carry out industrial development plans. If such imports are expected to be large, it will imply either rapidly increasing PRC exports or seeking some form of trade finance. In either case, more flexible international financial practices can be anticipated.

ACQUISITION AND DIFFUSION OF TECHNOLOGY IN CHINA

By HANS HEYMANN, JR.

SUMMARY

Evolution

The People's Republic of China has exhibited wide swings in its receptivity to foreign technology in the course of its 25-year history, oscillating between enthusiastic acceptance and determined rejection. In the 1950's—the era of close Sino-Soviet cooperation—China eagerly accepted what was undoubtedly the most comprehensive technology transfer in modern history. During that decade the Chinese obtained from the Soviet Union the foundation of a modern industrial system. In the process, however, the Chinese became heavily dependent on Soviet tutelage and were induced to adopt a Soviet model of forced industrialization inappropriate to China's resource endowment. In the late 1950's, the Chinese leaders began to reject this model and the overwhelming Soviet influence. The Great Leap Forward marked the reaffirmation of a more traditional Chinese nativism and self-assertion. Foreign technology and expertise were rebuffed and a policy of self-reliance instituted. Inept policies, successive crop failures, and the sudden withdrawal of Soviet technicians in 1960 combined to throw the Chinese economy into disarray.

A shift in the early sixties toward priority for agriculture and a return to a more permissive technology-import policy helped to revive the economy. While continuing to stress self-reliance, the leadership undertook selective purchases of European and Japanese plants and equipment, primarily as prototypes for learning and copying. By 1965, the economy had largely recovered from its earlier setbacks, only to be disrupted once more by the turmoil of the Cultural Revolution. The intense antiforeign campaign of that period again sharply curtailed acquisition of foreign technology, and by 1969 machinery imports had dropped to less than one-fourth of the peak levels attained 10 years earlier.

Since 1970, the Chinese leaders have turned outward once again for the acquisition of capital equipment and know-how on a substantial scale. No longer confining themselves to prototypes, the Chinese have purchased large numbers of complete plants and industrial complexes to enhance output in a half-dozen basic industries, primarily metallurgy, petrochemicals, and energy. Machinery imports, therefore, have risen more rapidly in recent years than during any previous period.

Self-reliance continues to be stressed, nevertheless, with at least three objects in view: (1) to minimize China's strategic and financial dependence on foreign countries; (2) to create a self-confident "new Maoist man" and guard against his contamination by alien influences;

and (3) to mobilize local savings so as to economize scarce foreign exchange and state investment outlays. The pursuit of self-reliance in these terms has enabled the Chinese to achieve a high degree of technical and economic independence of the outside world. China's own production of machinery and equipment is now so large that imported technology represents only a small fraction (perhaps 6 to 8 percent) of its overall technology accretion. In qualitative terms, however, technology imports are still a key factor in the development of the more sophisticated sectors of China's industrial production system.

Modes of Production

Three distinct modes of production coexist in China today: scientific laboratory industry, urban industry, and rural industry. Their interest in, and access to, foreign technology also differ sharply.

SCIENTIFIC LABORATORY INDUSTRY

Is an outgrowth of Mao's insistence that all research be linked to production. It is made up of small, scientist-guided pilot plants and laboratory workshops established within or under sponsorship of universities and research institutes. Laboratory industry focuses on trial production at the technological frontier, but it also produces sophisticated components in quantity, especially in electronics. Its principal aim is to achieve self-reliance in high technology. Thus, while it greatly values international scientific contacts and information, its demand for foreign technology is relatively small.

URBAN INDUSTRY

The principal claimant for foreign technology, consists of two subgroups:

(*a*) Large-scale basic and military industry, centrally controlled. This group includes all of the capital goods plants originally obtained from the Russians and subsequently expanded through large state investments. These plants mass-produce standardized output of tried and proven design. Lacking engineering experience, they tend not to be highly innovative. Their product quality and production efficiency stand to benefit greatly from the importation of modern process equipment and complete plants.

(*b*) Medium- to small-scale manufacturing enterprises, under provincial or municipal control. Most of these evolved out of simple workshops or machine shops established in the prewar era of private sector industrial development in China. They possess a depth of design and engineering experience that makes them much more dynamic and innovative than the large central plants. They enjoy considerable decisionmaking autonomy in upgrading their own technical capabilities and in promoting new product development within their own regions. But the more important campaigns to diffuse technology across provinical lines are largely directed from the center. The most advanced plants in this group do have access to foreign technology, principally in the form of production equipment and prototypes for adaptation or copying. In short, both of these urban industry subgroups are major end-users of foreign technology, with interests extending across the entire technology spectrum.

RURAL INDUSTRY

Technologically the least sophisticated, is entirely locally directed, operating at the level of the county and below. Its output, mostly non-standardized and of low quality, is mainly aimed at the needs of agriculture—chemical fertilizers, cement, energy, farm machinery, and implements. The rural production units, of which there are roughly half a million, derive their technological advances solely from a trickle-down process of internal diffusion from higher to lower economic administrative levels. Foreign technology has no significant role to play in this process.

In sum, for Chinese industry as a whole, the highly structured process of internal diffusion appears far more important as a source of technological advancement than the technology acquired from abroad. Foreign technology flows in only to the most advanced plants and activities. Even there, it is often used as much for training and demonstration as for increasing output. The Chinese leadership seems willing to accept some shortrun retardation of growth in order to attain in the long run the broader social goals of "mass participation" and "self-reliance."

Forms of Acquisition

For China today, the more significant forms of foreign technology acquisition are industrial exhibitions, prototype copying, and purchase of complete plants.

INDUSTRIAL EXHIBITIONS

Held in China by almost all advanced exporting countries, have proliferated in recent years. Thirty-two such exhibitions have been held since 1971 and six more are scheduled for 1975. Although exhibitors have found these ventures to be high in cost and low in commercial returns, faith in the existence of a "vast China market" nevertheless propels them to demonstrate their best, and to spice their displays with free lessons in technology: educational seminars, films, technical data, and glossy catalogs. For the Chinese, these shows are thus highly attractive. They make their search for relevant foreign technology remarkably easy and offer good opportunities for purchasing display models at favorable prices, for purpose of analysis, "reverse engineering," and copying.

PROTOTYPE COPYING

Extensively and effectively practiced by the Chinese, but it has serious limitations. Where the technological gap between originator and copier is great, extracting the technology embodied in a sophisticated design and absorbing it into an unsophisticated industry is often infeasible. Even with considerable assistance from the originator—his data and his experience—the copier's task is formidable and time-consuming. But since 1960, the Chinese have systematically rejected such assistance, fearing that it might hamper development of their own creativity. Today, however, the rejection is no longer total. Foreign technicians are once again being admitted, particularly to supervise erection of complex imported plants. The Chinese now reluctantly recognize that such assistance is often indispensable to the effective absorption of technology.

IMPORTATION OF COMPLETE PLANTS

In the past 3 years has become the principal form of technology acquisition. Contracts worth almost $2.7 billion have been let, principally to Japan, France, and West Germany, with plant deliveries extending through 1977. The purchases, however, are centered on only a few industries: petrochemicals, steel, power, and petroleum. Although these are fundamentally important, many other industries are similarly in need of a technology transfusion, including the automotive and aircraft industries, whose present inefficient and obsolescent output could be dramatically improved by the importation of modern production facilities. But negotiations for such plant purchases slowed in the latter part of 1974 and may be held in abeyance, awaiting a clarification of the current international economic disarray.

Prospects

In addition to this economic disarray, three other factors may constrain the further expansion of China's technology import drive: its absorptive capacity, its ability to pay, and its self-reliance principles.

ABSORPTIVE CAPACITY

The ability of a highly skilled technical manpower pool to adapt and assimilate sophisticated technology—could act as a serious brake on China's progress. It takes decades to develop such a pool, and China's persistent neglect of advanced education in favor of industrial empiricism and the "mass line" is bound to have a cumulative retarding effect.

ABILITY TO PAY

The ability to earn the foreign exchange necessary to pay for imports—is already a restraining factor. China's current balance-of-payments difficulties may, however, be eased, if not solved, by its favorable prospects for greatly expanded crude oil exports in future years. Such expansion, on the other hand, may itself require large additional technology imports.

SELF-RELIANCE PRINCIPLES

Finally, continue to impose their ideological inhibitions. If the leadership were to push the liberalizing trend too fast, a political counterreaction and a reversion to a more restrictive technology import policy could result.

CONTENTS

APPENDIXES

I. Introduction

As the Cultural Revolution drew to a close in 1969, the PRC's leadership began once again to turn outward and seek capital equipment and "know-how" on a significant scale. By the fall of 1974, what had begun as a modest trickle of orders by the Chinese for machinery and equipment had become a sustained flow. Contracts for complete production plants and huge plant complexes, some valued at as much as a quarter-billion dollars, were being concluded on an unprecedented scale, in order to raise output and productivity in a half-dozen basic Chinese industries—petrochemical, steel, fertilizer, power, petroleum, and mining. A wide range of sophisticated machine tools, of instrumentation, and of production and process equipment was being imported from more than a dozen countries, all vying for the privilege of conducting elaborate exhibitions of their industrial technology in Peking, Shanghai, Tientsin or Shenyang. China's longstanding insistence on paying for its current imports with current exports had clearly softened, and "deferred-payment purchase"— a euphemism for buying on credit—had become an accepted practice, provided the repayment term was kept short and the interest rate low. Most significant of all, for the first time in more than a dozen years, the PRC was permitting appreciable numbers of foreign technicians to accompany the new plants and remain on sites long enough to monitor proper installation and start-up. Though these technicians were being carefully designated "assistants" rather than "advisers," their admittance represents a substantial easing of past Chinese strictures against a visible role for foreigners.

What should we make of China's renewed pursuit of foreign technology? Is it merely a short-lived shopping spree that will quickly run its course? Or does it portend a new long-term trend away from China's basically autarkic, inner-directed philosophy and toward a development path orineted toward interdependence with the world economy?

Posing the alternatives in this way seems to imply that the Chinese are faced with a stark choice between autarky and interdependence. Obviously, that is not the case. The choices open to the Chinese leaders are more in the nature of tradeoffs between technical-organizational imperatives (economic values) and Maoist social-revolutionary aims (ideological values). The Chinese leaders must wrestle with the problem of how much productive efficiency and economic growth they should sacrifice for the sake of "creating the new Maoist man"—molding a highly motivated, disciplined, innovative work force uncontaminated by bourgeois values, economically independent, and technologically self-reliant—in other words, "liberated from worshipping foreign things;" and prominent in all this is the question of how much the economy should be permitted to rely on foreign technology. As this study will show, Chinese evaluations of these tradeoffs have fluctuated widely, with "ideo-logic" holding sway in periods of revolutionary fervor and "techno-logic" reasserting itself in calmer times. The consequences of these fluctuations are clearly reflected in China's technology acquisition policy.

The term "technology acquisition" is employed in this study in its most comprehensive sense. It encompasses any accretion of capital equipment or technical knowledge, from whatever source, that enhances productivity or reduces costs. Thus it includes both the tools (machinery, equipment, and plant) the Chinese must create or import to help them cope with their environment and the techniques (skill, know-how, and production processes) they must develop in order to produce or apply these tools.

The study also distinguishes among three kinds of technology: manufacturing technology—most directly related to physical production (skills of fabrication, techniques of processing, refinement of materials); design technology—the realm of science and creativity (research, development, test, and engineering); and management technology—the organizational aspects of large-scale manufacturing (mode of production, worker motivation, occupational stratification, and the structure of authority). As the study will show, Chinese industry has made the most impressive advances in the sphere of manufacturing technology, has made only modest strides in design technology, and in management technology is still in a rather elementary, exploratory stage. It is undoubtedly in these latter two areas that the Chinese stand to gain most from foreign experience, but they are also the areas in which there is likely to be the strongest Chinese ideological resistance.

The role that this ideological element has played in the evolution of China's technology import policy is considered further in section II of this report. Section III examines the several levels and modes of industrial production that now coexist in China, and attempts to assess the proclivity of each to acquire and diffuse technology. A fourth section weighs the merits of some of the more significant vehicles for acquiring technology which the Chinese employ—industrial exhibitions, prototype-copying, and complete plant imports. A final section briefly discusses key problems the Chinese face in continuing their pursuit of technological advancement.

II. Evolution of Technology Acquisition Policy

Policy Fluctuations and the "Two-Line" Struggle

How durable is the current resurgence of Chinese interest in foreign technology? Is it merely a brief interlude or does it represent a new long-term trend?

The PRC's behavior in the past provides little support for supposing this a long-term trend. Chinese development over the past 20 years has been marked by sharp oscillations between acceptance and rejection of foreign technology and expertise. In the view of most Sinologists, these oscillations reflect shifting fortunes in the "struggle between the two lines," between the pragmatic, conservative line identified with former Chief of State Liu Shao-chi, and the radical ideological line associated with Chairman Mao. That struggle involves contention over the most fundamental questions of political philosophy and socioeconomic goals, and affects every aspect of policy and program.[1]

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[1] Some Sinologists, however, explicitly reject the "two-line" interpretation. See, for example, the dissenting views of Frederick C. Teiwes, "Chinese Politics 1949–65: A Changing Mao," in *Current Scene*, vol. 12, January and February 1974. See also the attempt to develop a more sophisticated "four-line" interpretation by Michael Oksenberg and Steven Goldstein, "The Chinese Political Spectrum," in *Problems of Communism*, vol. 13, No. 2, March–April 1974, pp. 1–13.

TABLE 1.—CHINA'S DEVELOPMENT PHASES AND TECHNOLOGY-ACQUISITION POLICY (1952–74)

1952–57 1st 5-year plan: "Leaning to 1 Side"	1958–60 Great leap forward: "Walking on 2 Legs"	1961–65 Great crisis and readjustment	1966–69 Cultural revolution	1970–74 Post cultural revolution
DEVELOPMENT PHASES				
Maximum rate of fixed capital formation. Priority for development of basic industry. Forced draft industrialization; large-scale, centrally planned, integrated plants, Soviet style. Acceptance of principle of developing local industry serving local needs and utilizing local resources, but more lip service than practice.	1st signs of rejection of Stalinist model of industrialization in favor of Maoist all-out mass mobilization and mass participation. Proliferation of small-scale inefficient local enterprises with backyard technologies. Nurturing of local initiative and regional self-sufficiency.	Economic crisis forces shift of priority to agriculture. Return to Liuist approach: centralized planning and administration by professionals at national and provincial levels; return to economic rationality (uneconomic great leap plants closed). Rural industrialization pushed vigorously.	Reversion to Maoist principles, pitting masses against technical and managerial elites. Worship of nativism and renewed pitting of red against expert. Destruction of party bureaucracy; sporadic economic disruption; some absolute decline in industrial output.	Return to economic order; new wave of industrial expansion. Shift in planning and decisionmaking to regional and provincial levels, and further development of decentralized industrial plant in outlying regions. Use of the more advanced industrial centers to spread industrial systems into hinterland.
TECHNOLOGY-ACQUISITION POLICY				
Massive Soviet aid in form of complete plants and industrial systems. Soviet support targeted on heavy industry sector.	Soviet turnkey projects begin to phase down in face of mounting Sino-Soviet tension and Chinese resistance to foreign expertise. Sudden withdrawal of Soviet assistance, summer 1960, wreaks havoc.	Technology import resumes on small scale; a few package plants acquired as prototypes; stress on self-reliance; technology source shifted to Western Europe and Japan.	Imports of foreign technology drastically curtailed; some plant purchases cancelled; foreign contacts ruptured.	Return to more vigorous technology import policy; emphasis on complete plants, diversification of sources, greater flexibility on import financing.

NOTES

1. Underlying Data—The values reflected in this figure are in undeflated U.S. dollars. The data are intended to represent actual resource transfers (deliveries or disbursements), not contracts signed. The figures, in millions of U.S. dollars, are as follows:

Year	Total machinery and equipment	Whole plants
1952	211	----------------
1953	328	48
1954	380	107
1955	476	152
1956	612	230
1957	645	224
1958	846	187
1959	1,009	452
1960	742	433
1961	168	156
1962	59	18
1963	136	33
1964	180	31
1965	330	45
1966	455	50
1967	380	78
1968	275	20
1969	240	5
1970	395	(1)
1971	505	(1)
1972	520	70
1973	855	190

[1] Negligible.

Current versus constant prices. All values shown are in current prices. The inflation factor, however, is significant only for the last 4 yr. of the period covered (1970–73). During those years the prices of China's imports may have climbed by as much as 40–50 percent. In constant prices, therefore, the increase in the value of China's machinery and whole-plant imports in those years would be far less steep than shown. (See Alexander Eckstein, "China's Economic Growth and Foregin Trade," in "U.S.-China Business Review," July–August 1974, for a calculation of China's imports and exports in constant prices for 1952–73.)

SOURCES

Imports of Machinery and Equipment. 1952–64: Chu-yuang Cheng, "The Machinebuilding Industry in Communist China," Aldine-Atherton, New York, 1971, pp. 62–64. 1965–70: Joint Economic Committee, "People's Repubic of China: An Economic Assessment (A Compendium of Papers"), May 18, 1972, p. 353. 1970–73: "PRC International Trade Handbook," CIA research aid A-73-29. October 1973 and A(ER)74-63, September 1974.

Imports of whole plants. 1953–64: Alexander Eckstein (ed.), "China Trade Prospects and U.S. Policy," Praeger, New York, 1971, pp. 310–311 and pp. 276–277. 1965–73: Author's estimates, based on plant purchase data shown in appendix B.

The sharply fluctuating pattern of Chinese economic development and the effects of the ideological struggle on its policy for acquiring technology have already been vividly described by others.[2] I can therefore confine myself here to giving the briefest of summaries, through the use of a table. Table 1 shows the phases of China's economic development and how these are reflected in its policy for acquiring technology. While a table cannot hope to reveal the scope and subtleties of the issues, it does disclose the linkage between technology and development policies in the abrupt changes that have occurred. Periods of relative receptivity to foreign technology have alternated with periods of determined rejection, and these closely parallel changes in position on larger policy issues.

The Chinese ambivalence on foreign technology can also be illustrated in a more quantitative way by charting the ebb and flow of China's imports of machinery and complete plants in this same period (fig. 1). As the figure shows, these imports peaked in the latter fifties during the era of Soviet tutelage. It was largely that experience which shaped Chinese attitudes toward foreign technology. In that 7-year period, China was the recipient of what was undoubtedly the most comprehensive technology transfer in modern industrial history. The scope and significance of that transfer has not been generally appreciated in the West. At a time when China was weak and isolated, the Soviet Union, hoping to gain hegemony over its new Communist neighbor, provided China with the foundations of a basic industry. The Soviet contribution encompassed much more than production technology. It ran the gamut from scientific and technical education to project design, and from production engineering to creating a modern industrial organization, complete with planning, budgeting, and management systems.

Interestingly, in some areas of manufacturing, the style of the Soviet technology transfer was closely comparable to the United States-to-Japan transfer of the late 1950's and early 1960's.[3] Both cases involved what might be called interim coproduction arrangements under license on a succession of increasingly complex products. In the aircraft industry for example, the transfer progressed from trainers to simple jet fighters to more sophisticated aircraft and helicopters. A gradual phase-in procedure was followed in both cases, starting with the simple assembly of "knockdown" airframes, advancing then to component manufacture, and finally to completely indigenous production of the entire aircraft. Although the Chinese were far less advanced technologically than the Japanese of the late 1950's, and therefore far less prepared to absorb the new skills and techniques, they nevertheless made dramatic progress in the 7 years of the Sino-Soviet association.

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[2] See, for example, Alexander Eckstein's analysis of the successive phases of Chinese economic development in "Economic Growth and Change in China: A 20-Year Perspective," *The China Quarterly*, April–June 1973, especially pp. 238–241; also William W. Whitson's examination of the consequences of these phases for technology policy in "China's Quest for Technology," *Problems of Communism*, vol. 12, No. 4, July–August 1973, pp. 16–29.

[3] See G. R. Hall and R. E. Johnson, *Transfer of U.S. Aerospace Technology to Japan*, The Rand Corp., p. 3875, July 1968, for a detailed examination of this transfer experience involving Lockheed Aircraft Corp. and North American Aviation on the one hand and Mitsubishi Heavy Industries and the Kawasaki Aircraft Co. on the other.

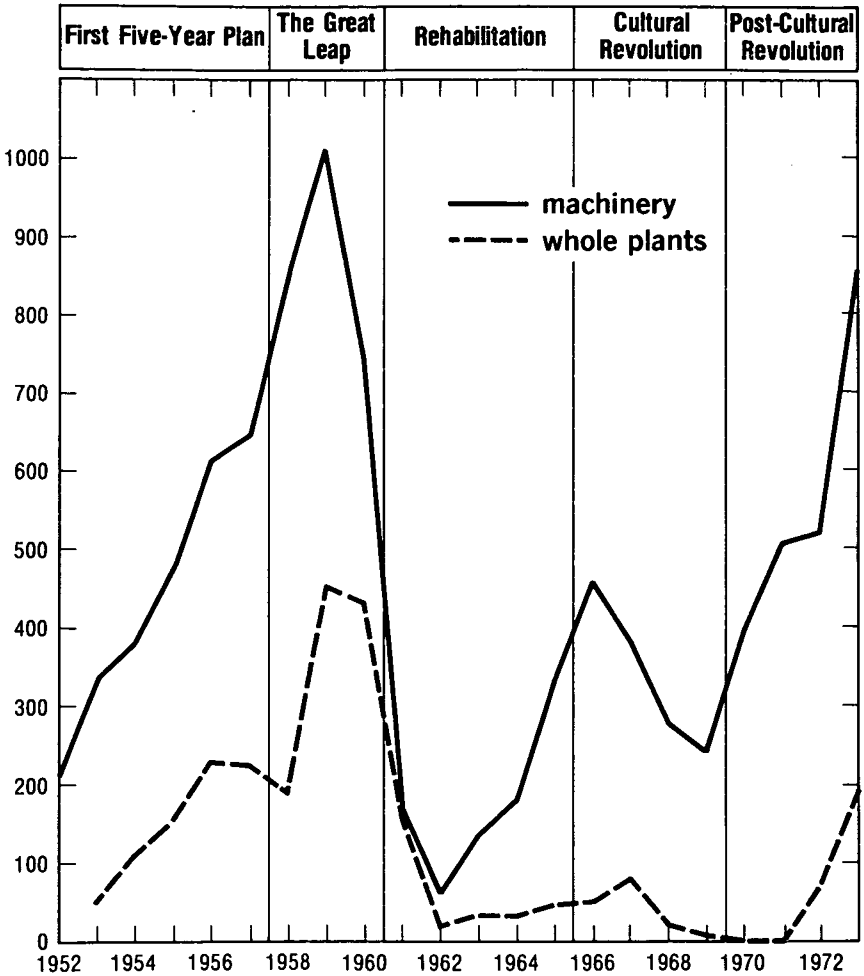

Fig. 1. China's imports of machinery and whole plants, 1952-1973 (in millions of U.S. dollars)

Both the Russians and the Chinese worked hard at the task of transfer and it proved highly effective, although more so in the sphere of manufacturing technology than in design and management technology. But there can be no doubt that, overall, the massive infusion of Soviet capital and know-how was invaluable to China's subsequent development. It would have taken the Chinese decades to evolve such a comprehensive industrial system on their own.[4]

[4] See M. Gardner Clark, *The Development of China's Steel Industry and Soviet Technical Aid,* Cornell University, Ithaca, N.Y., 1973, especially chapters 3 and 9 for an excellent assessment of the utility of Soviet assistance.

The large Soviet transfer of capital goods helped the Chinese economy to sustain a high rate of domestic investment in plant and equipment throughout the 1950's. Investment in fixed capital increased fivefold from 1952 to 1959, in conjunction with, or perhaps in consequence of, a parallel quintupling of machinery and equipment imports. As a result, China became heavily dependent on imports for its continued growth. During the 1950's, perhaps as much as one-half of all the machinery and equipment installed in China came from abroad, predominantly from the U.S.S.R., but also from the Eastern European socialist countries.

The Break With Soviet Tutelage

By the late fifties, it had become clear to the Chinese that the Soviet beneficence was a mixed blessing. Not only had it made them heavily dependent on imports and on Soviet tutelage, it had enticed them into a blind acceptance of the U.S.S.R. as a prototype for their own industrial development. Moreover, the style of Soviet assistance was patronizing and paternalistic. Inevitably, all this evoked a sharp reaction. To save their independence and self-confidence, the Chinese felt compelled to reject that degree of foreign influence. The Great Leap Forward marked the break with dependency and the reaffirmation of a more traditional Chinese nativism and self-assertion. It spurred a great outpouring of sentiment against foreign technology, a pitting of "red" against "expert," and an effort to inspire peasant initiative and stimulate worker innovation. Its aim was to mobilize China's vast human and material resources. It was the first step in what soon became a total rejection not only of Soviet technological guidance, but of the inappropriate forced-industrialization Soviet model, in favor of a more rational "agriculture first" model of China's own creation.

The cataclysmic short-term economic consequences of the Great Leap are well known. Inept policies and gross mismanagement, two successive crop failures, and the precipitous Soviet withdrawl in 1960 combined to bring the Chinese economy, in Eckstein's words, "to a state of prostration similar to that produced by war devastation." [5] In the early 1960's, domestic investment was cut back sharply and imports of foreign machinery and equipment declined even more, as the Chinese sought to cope with the consequences of their earlier dependency. A policy of self-reliance or import substitution was instituted, and a substantial surplus of export trade had to be maintained for several years, in order to repay the sizable Soviet credits that China had accepted bewteen 1950 and 1957.

By 1965, the economy had largely recovered from its earlier setbacks and both domestic investment and foreign trade, especially machinery imports, were again on the rise, only to be cut back once more by the turmoil and disruptions of the Cultural Revolution. By 1969, therefore, China's machinery imports had dropped to less than one-fourth of the peak levels attained 10 years earlier.

Since 1970, the Chinese economy has experienced a new wave of expansion, and both imports and exports have risen more rapidly than during any previous period. In the meantime, however, China's GNP has grown very substantially, so that foreign trade now represents

[5] See Eckstein, "Economic Growth and Change in China: A 20-Year Perspective," *The China Quarterly*, April–June 1973, p. 240.

only a small fraction of the GNP. It appears that the inward-looking, go-it-alone, bootstraps approach to modernization followed after 1960 has enabled the Chinese to achieve a high degree of technical-economic independence of the outside world. Quantitatively, its reliance on foreign trade is now marginal. China's total imports in 1973 are estimated at $4.5 billion,[6] which represents, roughly, 2.5 percent of its GNP.[7]

Moreover, in 1973, imports of machinery and equipment, including complete plants, amounted to $855 million. This represents approximately 6 to 8 percent of China's own machinery and equipment production.[8] While all of these numbers are crude, they are not likely to be far enough off the mark to invalidate the observation that, quantitatively, imported technology represents only a very small share of China's overall technology accretion.

Qualitatively, on the other hand, it represents a crucial element in China's economic development, inasmuch as it provides a unique vehicle for gathering knowledge and goods essential to the process of industrialization. The Chinese are likely to continue to import technology, notwithstanding their recurrent injunctions to be "self-reliant."

Shadow and Substance of "Self-Reliance"

What do the Chinese mean by "self-reliance" and what lies behind the slogan? At first blush, it seems curious that a renewed campaign of exhortation should have been launched in the Chinese press in early 1974, at the very time that China's involvement with foreign technology had moved into high gear. It may clarify matters somewhat if we distinguished among three aspects of policy: broad national strategy, ideological transformation, and resource mobilization.

The aspect relating to broad national strategy has already been touched upon: self-reliance here means avoiding dependence. Humiliated by a century of "unequal treaties" and imperialist encroachments, the Chinese leaders were highly sensitized to any impairment of national dignity. The Sino-Soviet rupture was to them another object lesson in the dangers of foreign dependence. They are determined never again to permit their economy to become strategically vulnerable to a cutoff from any exclusive source of supply. For any important category of goods, therefore, their imports are now widely diversified internationally. The Chinese, after having had to starve themselves in the early 1960's to repay their Soviet credits, are equally determined to avoid any significant financial dependence on foreign countries. Hence their conservative pay-as-you-go trade financing policies. Unlike the vast majority of underdeveloped countries saddled with staggering foreign debt service burdens, China is virtually free

[6] *United States-China Business Review*, vol. 1, No. 2, March–April 1974, p. 33.

[7] Arthur Ashbrook ventures a figure of $128 billion for China's GNP in 1971 at 1970 prices. (See Joint Economic Committee, *Compendium*, 1972, p. 47.) Allowing for real growth and dollar price inflation, the 1973 figure might be on the order of $170 billion. A figure of $172 billion, derived from U.S. Government sources, is given in the *United States-China Business Review*, op. cit., p. 33.

[8] Ashbrook estimates China's gross investment at 18 percent of GNP in 1971 (Joint Economic Committee, *Compendium*, 1972, p. 45). Taking net fixed capital formation as 16 percent and the machinery and equipment share as accounting for half of that (based on estimates by Kang Chao for 1952–65, cited in Robert F. Dernberger, "The Transfer of Technology to China," *Asia Quarterly*, 1974/3, p. 238), one obtains a 1973 machinery and equipment figure of $13.6 billion. A much higher figure is implicit in Chinese statements placing 1971 machinery output at 13 times the 1957 level.

of such burdens and now finds itself in an enviably creditworthy position. In terms of economic strategy, self-reliance has surely paid off.

The policy aspect of ideological transformation is more difficult to assess, partly because issues are expressed in a highly polemical way, and partly because, as has already been indicated (see above, p. 682), decisions involve complex tradeoffs between sociopolitical and economic values. To oversimplify, self-reliance here means building confidence and guarding against alien contamination. It is part of the continuing Maoist revolutionary struggle to transform man into a classless, unselfish, dedicated member of society, confident in his ability to solve the technological problems of development. In the characteristic "two-line struggle" formulation, the official campaign extols the virtues of Chairman Mao's correct line of

> maintaining independence, keeping the initiative in our own hands, relying on our own efforts and on arduous struggle, and building our country through diligence and frugality,

and it warns against the evil Liu Shao-chi/Lin Piao revisionist line of

> worshipping foreign things, trumpeting the slavish comprador philosophy and promoting the mentality of trailing behind at a snail's pace.[9]

To be sure, self-reliance is not intended to mean self-sufficiency or complete autarky. Foreign technology may be acquired in the short run so as to reduce the need for such imports in the long run. "The introduction of a bit of foreign technology is permissible * * * [but] we can only use it as reference and must actively catch up with it"; what China is doing, the PRC's Minister of Foreign Trade tells us, is "putting into practice the principle of making foreign things serve China and combining learning with inventing in order to increase her ability to build socialism independently, with her own initiative...."[10]

"A bit of foreign technology," however, carries with it a bit of foreign presence and the corrupting influence of bourgeois values. Against this, Chinese leaders are vigilant, strictly controlling and limiting the exposure of their people to such influences. The self-isolation and clannishness of Chinese technical groups sent abroad and the circumscribed access permitted to foreign technicians in China are symptomatic of this fear of contamination.

Resource mobilization, finally, is perhaps the most important and least well recognized aspect of the self-reliance policy. The Chinese leaders realize only too well that the needs and desires for advanced technology in Chinese industry are almost infinite, simply because the reliability and productivity of most foreign machines are so much greater than those produced at home. But China's ability to import technology is critically constrained by its limited capacity to earn foreign exchange. No foreseeable increase in that capacity could fully satisfy China's potential needs. Undoubtedly a major purpose of the call for self-reliance is to exert ideological pressure and social suasion upon industrial managers to get them to rely as much as possible on the resources of their own enterprises or localities, and thus reduce the clamor for imported technology. The effort to stimulate use of

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[9] Tien Chih-sung, "Adhere to the Policy of Independence and Self-Reliance," *Jen-min Jih-pao*, Peking, Mar. 22, 1974 (*SCMP*–74–14, No. 5584, Apr. 4, 1974).

[10] Li Chiang, "New Developments in China's Foreign Trade," *China's Foreign Trade*, No. 1, May 1974.

local resources as a substitute for relying on imported resources is not applied only in connection with foreign technology. It is aimed equally at all forms of capital allocated from the center, with a view to limiting the demand for such capital. The Chinese press regularly features laudatory reports of factories or workshops that scrap expansion plans requiring costly equipment and large state investments, and yet, at a fraction of the originally projected investment cost, achieve the needed capacity increase through reliance on their own efforts. The purpose of self-reliance in this context, then, is to economize capital and to mobilize local savings, and this aspect of self-reliance has had much to do with the way Chinese industry is structured and how it absorbs and diffuses technology.

III. Technological Advancement: Modes of Production

To understand better how foreign technology ties into Chinese industry and how technology generally is diffused within industry, we must look more closely at the structure of industrial production that has gradually evolved in China. It is helpful to distinguish among three different modes of production. These are differentiated quite sharply here for purposes of underlining the distinct character of each, although, in fact, categories often overlap or coalesce. The three modes are ranked in descending order of technological sophistication:

1. Scientific laboratory industry;
2. Urban industry;
   (a) Centrally-controlled large-scale basic and military industry;
   (b) Province and municipality-controlled medium-scale industry; and
3. Rural industry.

The modes differ sharply in character and in their need for and access to foreign technology, and it is useful to examine each separately.

Scientific Laboratory Industry

This stands at the top of the sophistication pyramid. A uniquely Chinese institution, scientific laboratory industry grew out of Mao's insistence that all research be linked to production and out of an educational philosophy that espouses "learning by doing." Hence, purely basic research is restricted to a few vital areas,[11] and no research at all is officially sanctioned unless clearly aimed at practical results or designed to meet specific, important economic or social needs. Scientific institutes typically couple their research and development activities with manufacturing, through a variety of organizational arrangements. The most common are to set up production workshops within their own institutes, to establish separate pilot plants nearby, or to adopt and reorganize existing neighborhood factories so as to enhance their production competence.[12] These scientist-guided labora-

[11] One such, not surprisingly, is nuclear physics. In that area the Chinese Institute for Atomic Energy Research carries out a wide range of basic investigations in low- and high-energy physics and cosmic radiation. (See the report on the visit of the Max Planck Institute scientists to the Nuclear Research Institute near Peking in *Die Welt*, Hamburg, May 18–19, 1974, supplement, p. 5.) On the other hand, even in an area as high priority as agriculture, basic research appears to be almost nonexistent. A team of outstanding U.S. plant scientists that spent a month in China in August–September 1974 was greatly impressed with the effectiveness of agricultural field experimentation and extension service, but found fundamental research in Chinese agricultural colleges and leading research institutes to be in a state of stagnation. (A detailed report on the observations of the U.S. Plant Sciences Delegation in the PRC is scheduled for publication in early 1975.)

[12] Peking's Tsinghua University has no less than 9 factories and 21 workshops of its own. (Peking NCNA, Sept. 15, 1974.)

tory workshops and plants can turn out surprisingly large quantities of sophisticated devices, especially in the field of electronics. For example, the Physics Department of Tsinghua University in Peking manufactures integrated circuits by the thousands; these are produced in the university's laboratory workshop by students and teachers working more or less by hand, but using sophisticated photoreduction techniques, ultrasonic bonding, and optical systems produced by the Chinese Institute of Optics. The Institute of Electronics of the Academy of Science in Peking, which specializes in millimeter wave and microwave research, manufactures klystrons, traveling-wave tubes, and carcinotrons.[13] One of the most bizarre examples is that of the Shanghai Institute of Computing Techniques. In 1970, that Institute adopted a neighborhood factory that produced nothing but metallic window-handles with an initial workforce of 20 housewives. The Institute gradually taught this workforce to produce, under quite primitive conditions, magnetic cores, computer mainframes, and transistors. A team of U.S. computer experts visited this factory and actually observed assembly work on an integrated circuit digital computer.[14]

Of course, these workshops and their scientist and institute sponsors are primarily aimed at achieving self-reliance in high technology, and at demonstrating that they can innovate and fashion the equipment and tooling they need without external assistance. Thus, their interests in foreign technology are limited to such things as scientific information, technical literature, scientific exchange visits, and specialized instrumentation. Quantitatively, therefore, they make small claims on foreign technology; qualitatively speaking, however, their connections with the international scientific community are vital.

Urban Industry

The next level of the pyramid, urban industry, is the principal claimant for foreign technology. This category consists of two subgroups:

(*a*) Basic and military industry complexes, vertically and horizontally integrated, Soviet-style. These are in most cases under the direct control of the central ministries. Where not, Peking at least determines their plans and policies. These industries include all of the large metallurgical, machine building, automotive, aircraft, and electronic component plants originally obtained from the Russians but greatly expanded since, as a result of major state investment outlays. They also include largely indigenous Chinese ventures such as the massive petroleum extraction effort in the Taching, Shengli, and Takang oil fields.[15] The main object of these industries is large-scale, standardized output, and their interest in foreign technology extends to anything that might enhance that output. But innovation policies in these large-scale plants tend to be conservative. The enterprises are relatively young and their skill levels not highly developed. Their design engineers are still few in number and limited in experience. They are more likely to direct their innovative energy toward gradual product improvement, and marginal innovations in the production line than toward introducing radically new equipment designs or creating novel production flow patterns. These important industries, therefore, stand to benefit greatly from the importation of complete, sophisticated plants with their astonishing economies of scale. The integrated hot and cold steel rolling mills, for example,

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[13] Gloria B. Lubkin, "Physics in China," *Physics Today*, December 1972.

[14] Thomas E. Cheatham, Jr., et al., "Computing in China: A Travel Report," *Science*, October 1973. See also B. O. Szuprowicz, "Computers in Mao's China," *New Scientist*, Mar. 15, 1973.

[15] This is not to denigrate the valuable assistance, especially in the form of oil drilling and refining equipment, that the Chinese have received at various stages, principally from Romania.

that are to be built by Japanese and West German consortia at Wuhan over the next 3 years will not only increase China's steel rolling capacity by some 25 percent, but will also have a dramatic impact on cost of production and quality of product.

(*b*) Medium- to small-scale industrial enterprises. These are mostly under the control of the provinces or municipalities and exist side by side with the large central plants. They are not only smaller but older than the central plants. Their legacy dates back to the prewar era of private sector industrial development in China. Most of these enterprises began as simple work shops or machine shops, and moved progressively into specialized repair and overhaul, parts manufacture, and finally production of complete sets of equipment. In the course of this evolution, many of them were merged into larger entities. For example, the Canton Motor Vehicle Plant that manufactures the "Red Guard" 3½-ton truck started out in the early 1960's as the Huang-Pu Machinery Plant, which had been formed by combining a half-dozen small machine and repair shops. These plants are highly dynamic and growth-oriented. They engage in much subcontracting and cooperative new-product development. When it was realized in 1970, for example, that semiconductor production required large numbers of single-crystal furnaces, the Shanghai municipality enlisted 12 factories and institutes in the design and assembly of such furnaces, and reportedly succeeded in getting the first furnace into trial production in 13 days.[16] Since many of these provincial and municipal plants serve mostly regional needs, their output is often not standardized, but their operations appear to be far more flexible and innovative than those of the large centrally directed enterprises. They enjoy the advantage of a far more experienced workforce with a demonstrated ability to copy and adapt foreign technology to their own needs. They are constantly driving themselves, and being driven, to achieve higher levels of technology and to improve the quality of their output and extend its range. Although the provincial and municipal authorities enjoy much autonomy in organizing production and deciding how tasks are to be carried out, it is difficult to believe that the center does not control such critical matters as the determination of priorities and technology diffusion policy, including access to foreign technology.

On this, however, the evidence is sketchy and contradictory. Audrey Donnithorne, in a 1972 article,[17] emphasized the declining importance of the center and the extent to which provinces, municipalities, and even counties (hsien) seemed to be developing along self-sufficient, autonomous lines, under the official injunction "to build small but complete industrial systems by self-reliance." She observed that these entities seemed to be trading with one another on almost mercantilistic principles. She also noted that these local enterprises tended to expand or to create new enterprises out of their own resources, rather than relying on planned coordination by the center and on state investment grants.

It is clear that this kind of autonomous intraprovince and intramunicipality development and diversification has been going on. At the same time, however, an equally important, and more far-reaching process of diffusion has been taking place across provincial lines, a process that is very much centrally initiated and state funded. Often it takes the form of massive nationwide campaigns, such as the "general battle for radio and television equipment" that was launched by the central leadership in 1971. As a result of that campaign every province, municipality, and autonomous region was able within 2 years to produce its own transistor radios; 26 areas achieved at least trial production of television receivers.[18] Such feats manifestly require both central direction and central resource allocation.

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[16] "China's Young Electronics Industry," *China Reconstructs,* February 1974, p. 8.

[17] "China's Cellular Economy: Some Economic Trends Since the Cultural Revolution," *China Quarterly,* October–December 1972, pp. 605ff.

[18] Op. cit., *China Reconstructs,* February 1974, p. 8.

A look at the automotive industry further demonstrates that nationwide diffusion of production technology does not take place solely through autonomous local action. Toward the end of the Cultural Revolution, the regional propagation of truck production became an important state objective. Although provinces and municipalities throughout China organized themselves to manufacture trucks locally, their efforts were thoroughly dependent on the guidance, training, and technology provided to them especially by China's second largest automotive plant, the Nanking Motor Vehicle Plant, which had been selected as a kind of "lead plant." Its popular NJ–130 "Leap Forward" 2½-ton truck was designated as the prototype, and it became the most widely copied truck model throughout China. By 1970, it was possible to identify from Chinese press accounts new manufacturers of this truck in at least nine provinces.[19] In a more limited way, China's largest automotive plant, the Changchun No. 1 Motor Vehicle Plant in Manchuria, performed a similar function by transferring the technology of its 4-ton and 4½-ton "Liberation" trucks to several other provinces.[20] Some recent data on Chinese motor vehicle production [20a] also reveal a fair amount of production interdependence among plants across province lines. For example, engine plants in Shanghai and Hangchow provide the 160-horsepower diesel engine that powers the "Yellow River" 7-ton dump truck made in Tsinan, and the Peking Motor Vehicle Plant that makes the "Long March" 10-ton cross-country truck receives its big diesel engine all the way from Sian (Szechwan). In short, the image of self-sufficient provincial "cellular" economies is more than a little overdrawn.

To what extent do these provincial and municipal enterprises benefit from foreign technology? As has been indicated, their principal source of new technology is a combination of self-help, improvisation, and a process of proliferation of know-how and exchange of experience within the country. But the most advanced plants also have direct access to technology from abroad, most importantly in the form of technical information and prototypes. This is especially true of plants in such important industrial cities as Shanghai, Peking, Tientsin, Tsinan, Wuhan, and others. For example—looking again at the automotive industry—the "Long March" 10- and 12-ton trucks produced by the Hopeh Changcheng Plant in Peking and the "Yellow River" 8-ton truck made at the Tsinan Motor Vehicle Plant are the result of extensive technology assistance provided in the early 1960's by Czech manufacturers (Tatra and Skoda) respectively). The Shanghai Truck Plant, in developing its 15-ton and 32-ton dump trucks, depended heavily on design data and technology obtained from the Belaz automobile factory in Minsk, and it learned much from a technology license for a French 32-ton truck purchased from Berliet in 1966. Most recently, in January 1974, the Gleason Works of Rochester, N.Y., obtained an $8.2 million contract for complete sets of sophisticated gear-grinding and axle-producing machinery,[21] to be custom-built to

[19] Wuhan (Hupeh), Nanchang (Kiangsi), Changte (Hunan), Taiyuan (Shansi), Liuchow (Kwangsi), Paotow (Inner Mongolia), Chengchow (Honan), Foochow (Fukien), and Fushun (Liaoning).

By 1972, the first two of these (the Wuhan and the Nanchang plants) had attained a sufficiently high technical level to warrant being listed in the PRC Motor Vehicle Handbook as independent producers of this model truck, each with a brand name of its own.

[20] Hsining (Tsinghai), Kunming (Yunnan), and Taiyuan (Shansi).

[20a] *Technical Handbook for PRC Motor Vehicles*, August 1972, published by the People's transportation Agency, Peking (partially translated in JPRS 60262 Oct. 12, 1973).

[21] *United States-China Business Review*, No. 2, vol. 1, March–April 1974, p. 10.

the needs of six Chinese motor vehicle plants, at least four of which appear to be in the medium- to small-scale category.

In short, both the large-scale central plants and the smaller scale provincial and municipal plants are major end-users of foreign technology. Their interest extends across the entire technology spectrum, as demonstrated by the major products they import: critical materials that lie beyond China's present technical ability to produce (super alloys, special steels, composite materials); high-performance end products that are urgently needed for the priority tasks of the Chinese economy (earthmoving and off-the-road vehicles for construction, drilling rigs and pipe for offshore oil exploration, dredges for port development, modern trucks and jet airliners for transportation, satellite ground stations for communication); sophisticated equipment obtained as one-of-a-kind or two-of-a-kind prototypes for copying; and, most important, imports of complete plants to boost output in key industries (steel rolling, petrochemical and fertilizer production, power generating, petroleum extracting, and coal mining). The PRC's imports in all of these areas have increased significantly in the past several years.

Rural Industry

Although technologically the least sophisticated, small-scale local industries are constantly growing and proliferating. They are not centrally planned or controlled, but rather are directed or coordinated almost entirely at the level of the county. They generally fulfill three conditions: they use raw materials which are locally available, they manufacture locally, and their products are, in the main, distributed locally. Their output, mostly nonstandardized and of low quality, is principally aimed at serving the needs of agriculture within their own regions. The small-scale plants located near big urban centers are a major exception. They are more likely to be tied into the urban industrial system, which may provide them with materials and with markets for their products. Hence these suburban or exurban local plants tend to be technically more advanced than the purely rural units. Rural units, of which there may be as many as half a million, fall basically into five closely complementary categories: energy (hydroelectric power and coal), cement, chemical fertilizers, iron and steel, and machine building. Collectively, they now produce enough to fill a large share of China's total agricultural needs.[22]

These local industries derive their technological advances solely from a trickle-down process of internal diffusion from higher to lower economic-administrative levels—from province to county, county to commune, commune to production brigade, et cetera, with each higher level providing technical guidance, training, and equipment to the lower levels. The diffusion process is aided by a local technology system that includes a "mass scientific network" (an agricultural extension service), formalized local problem-solving groups, and "farm machinery research institutes," which carry out trial manufacture and popularization work.

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[22] According to published CIA estimates, small plants currently contribute more than 50 percent (by weight) of nitrogenous and 75 percent (by weight) of phosphate fertilizers. They also provide almost all of the simple agricultural tools and enough cement to meet practically all local needs. (See *China: Role of Small Plants in Economic Development*. Central Intelligence Agency, Research Aid, A[ER]74–60, May 1974, p. 1.)

At a higher level, the diffusion process is often highly organized and complex. For example, in 1970, Shanghai was assigned the task of designing and producing reasonably efficient standardized packages of equipment for small-scale rural synthetic ammonia production. It took 2 years, 10,000 people, a network of 400 plants in the Shanghai area, and a tremendous coordination effort, to turn out enough machinery, instruments, and gauges to furnish 300 sets of such equipment packages.[23] By now, many other provinces have acquired this kind of management-coordination technique. Rural industries are increasingly drawn into the network to supply the simpler components. These lower echelon industries have a strong incentive to upgrade their technical competence. Greater proficiency enables them to mesh with the production processes used at parallel and higher levels, and thus to raise the acceptability and profitability of their output.

In rural industry, technology acquisition is entirely an internal process. It encompasses rural mobilization, basic technical education, and on-the-job development of skills. It is a process of diffusing technology vertically and horizontally and of engendering mass participation and mass initiative. Foreign technology has no significant role to play in this process.

Looking at all three modes of industrial production in China, the highly structured process of internal diffusion appears far more important as a source of technological advancement than the technology acquired from abroad. Foreign technology flows in only for industries at the top half of the pyramid, to the most advanced plants and activities. Even there new equipment, processes, and techniques are often used as much for training, education, and demonstration, as for increasing output. Western visitors to Chinese factories frequently comment on the astonishingly high labor/capital ratio, the large number of seemingly redundant workers milling around the machinery. While they recognize that this can be partly explained by the relative labor abundance and consequently low real wage costs in the Chinese economy, they are often unaware that there is also a large amount of in-plant training and "advanced experience sharing" that is continually carried on. Evidently, the Chinese leadership is willing to accept the cost of some temporary decrease in productivity, some shortrun retardation of growth, in order to attain in the long run the broader social goals of "mass participation" and "self-reliance."

IV. Technological Advancement: Forms of Acquisition

To analyze more particularly the significance of the contribution foreign technology makes, or could make, to Chinese development, we shall consider separately three of the more significant forms of acquisition: industrial exhibitions, procurement of "prototypes" for learning and copying, and purchase of complete production plant and process equipment.

Education by Exhibition

A seemingly popular, but little-publicized vehicle of technology transfer to China is the industrial fair or technological exhibition.

[23] See Jon Sigurdson, "Rural Industry and the Internal Transfer of Technology in China" (paper presented at University of Sussex Workshop, June 1974), for an excellent discussion of this experience.

These seem popular, for almost every one of the more industrialized countries of the world has held or is planning at least one such exhibition in China. But they receive little publicity, because each exhibition is treated as only a minor commercial event in the country that stages it. Accordingly, o· .side of a narrow circle of China traders, there is little appreciation of the scope of these exhibitions, or of the astuteness with which the Chinese eploit the opportunities they offer.

Curiously, for the exhibiting countries, conducting industrial fairs in China is not a particularly attractive proposition. The logistics are formidable and require as long as 2 years' preparation. The cost, both in money and executive time, are high—close to $2 million for the 1972 Canadian fair, $1.5 million for the 1973 British fair, and a similar sum for the Australian display held in October 1974—and the commercial rewards to the individual firms are usually negligible, limited for the most part to discounted sales of the display models at the end of the show. And yet, country after country is willing to make the trek, so intense is the competition for export sales, so abiding the faith in the existence of a "vast China market," and so tempting the opportunity the exhibition offers to penetrate behind the Chinese trade corporations and meet face-to-face the industrial end-user who makes the critical purchase selections.

The striking record of technology exhibitions held in China in recent years is shown in table 2. A few such exhibitions were held in the 1960's, until they were stopped by the antiforeign campaign of the Cultural Revolution.[24] Since 1971, however, they have proliferated. By the end of 1974, no less than 32 will have been held, with six more planned for 1975.

While the table gives some impression of the variety of these exhibitions, it does not reflect their highly advanced technological quality or the fact that, largely in response to Chinese urgings, they are educational, rather than commercial in character. These aspects emerge more clearly from the tabulation in appendix A, which provides a more detailed description of the exhibitions held and planned.

Some highlights are worth noting:

The exhibitors tend to be the most prestigious and they show the latest and most advanced technology the countries have to offer in fields of particular interest to the Chinese, often including devices never demonstrated previously anywhere.

Some exhibits are shown in more than one city.

The exhibits typically feature hundreds of technical seminars and industrial films, backed up by demonstrations and displays.

Great quantities of technical data and glossy catalogs, specially printed in Chinese, are made freely available.

Visitors are selected by the Chinese, usually by invitation only, and appear to be largely composed of highly qualified specialists from major manufacturing and research centers.

[24] A Swedish exhibition that was about to open in early 1967 was canceled when the ship carrying its exhibits was actually turned back when it steamed into Shanghai Harbor.

TABLE 2.—FOREIGN INDUSTRIAL EXHIBITIONS IN CHINA, 1971–75

year	Exhibitions by year, type, exhibitor, and site: National exhibitions: Exhibitor	National exhibitions: Site	Specialized exhibitions: Exhibitor and type of exhibition	Specialized exhibitions: Site	Exhibitions by year, site, and number: Site	Number
1971	Romania	Peking	Hungary:: Medical instruments, medicine	Peking	Peking	3
1972	Denmark	do	Japan: Electronic measuring instruments	Tientsin	Peking	6
	Sweden	do	Bulgaria: Medicine	Peking	Shanghai	1
	Canada	do	Japan: Machine tools	Shanghai	Tientsin	3
	Italy	do	Japan: Construction machinery	Tientsin	Peking and Shanghai	1
	France	Peking and Shanghai	Hungary: Machinery, vehicles	do		
			Poland: Construction and mining equipment, engines	Peking		
1973	United Kingdom	Peking	Norway: Gas turbines, industrial electronics	do	Peking	5
	Netherlands	do	East Germany: Machine tools	Shanghai	Shanghai	1
			Japan: Electronic and medical equipment	Peking		
			France: Measuring and scientific instruments	do		
1974	Austria	do	Hungary: Electrical instruments	do	Peking	7
	France	do	Canada: Electronics, scientific equipment	Shanghai	Shanghai	1
	Mexico	do	Switzerland: Machine tools, watches	Peking	Tientsin	2
	Australia	do	Denmark: Electronics, medical instruments	Shanghai and Peking	Shenyang	1
	Romania	(1)	Poland: Mining equipment	Tientsin	Peking and Shanghai	1
			Japan: Agricultural machinery, fertilizers	Peking		
			Japan: Printing and packaging	Tientsin		
			East Germany: Agricultural machinery	Shenyang		
1975	Belgium	Peking	United Kingdom: Machine tools, scientific instruments	Shanghai	Peking	5
	West Germany	do	Hungary:[2] Machinery, vehicles	Peking	Shanghai	1
	Argentina[2]	do	East Germany:[2]	(1)		
	Japan	do				
	Yugoslavia	do				
Total						38

[1] Not known.

[2] Planned for 1975.

In short, the exhibitions make the search for relevant foreign technology remarkably easy for the Chinese. They are treated, at virtually no cost to themselves, to a perpetual high-level technical symposium, in which executives of leading international firms act as teachers and demonstrators, and Chinese technicians as students and referees. Just how well they are able to absorb the lessons, and how sound their purchase decisions are, is difficult to assess. Only a few things can be learned from looking at a display model, hearing it described, and reading a technical sales brochure. Buying the model for the purpose of analysis and "reverse engineering" is obviously far more rewarding. The industrial fairs offer good opportunities for purchasing such models at bargain-basement prices, since exhibitors see selling them as a foot in the door to the China trade and would also prefer to avoid paying the return freight for their exhibits. But prototype copying has its limitations.

Prototype Copying

The procurement of a wide variety of one- and two-of-a-kind prototypes is a form of acquisition which the Chinese have developed into something of an art form. In addition to purchasing display models at trade fairs, the Chinese have opportunities to locate appropriate technology when their technical missions are taken on plant visits abroad. In recent years, a great number of such missions have been roving the world, similarly gathering free lessons in technology. In 9 months of 1973, no less than 53 Chinese technical teams visited Japan alone.[25]

Recorded instances of successful Chinese prototype copying, done without any outside assistance, are legion. The Massey-Ferguson 35-horsepower tractor is one of the earliest examples, and the Hasselblad 500 C/M camera one of the most recent. Copying need not, of course, take the form of completely reproducing an item. The Chinese often purchase a piece of modern equipment, such as a more advanced Massey-Ferguson tractor, because of their interest in only one element, for example, an improved transmission, which they then proceed to copy. Selective technical upgrading of this sort is apparently done on a large scale.

But prototype copying also has serious limitations. First, the prototype to be copied must be at the right level of sophistication—with respect to design engineering, fabricating skill, machining precision, and materials applications—relative to the competence the Chinese themselves have attained. If the item is too advanced, reverse engineering becomes too difficult. Even the relatively simple matter of hand-fashioning or custom-building a single duplicate is arduous enough. Without access to the design and manufacturing data, the copier must recreate the basic blueprints, the detailed engineering drawings, and, most important, the materials specifications. Devising adequate materials specifications often requires sophisticated metallurgical analysis, testing, and experimentation. The followup problem is equally difficult—the level of fabricating technique attained by the copier may not be adequate to duplicate the metal-casting, forming, shaping, joining, and finishing operations required to achieve the necessary endurances, tolerances, and dimensional accuracies.

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[25] *China Trade Report,* September 1973, No. 322.

The task becomes even more trying when the objective is not merely to fashion a single duplicate, but to achieve a series production run. Large-scale production is ultimately the touchstone of manufacturing efficiency. Hand-fashioning, custom-building, and batch-type production are still typical of much industrial production in China, and given the multisector nature of the Chinese economy—with modern, intermediate, and primitive technologies existing side by side—these small-scale, labor-intensive techniques will no doubt continue in use for many years. But for the modern, capital-intensive sector, acquisition of efficient, high-volume production methods and advanced management technology is indispensable.

Moving into large-scale production imposes the additional requirement of design standardization to achieve perfect interchangeability of parts and components; it also involves production tooling, plant layout, materials, and work scheduling, and quality control. Again, without assistance from the originator, the copier's task is formidable and time consuming. The prototype reveals only what was produced; it does not reveal how it was produced.

And that raises the second major limitation: when the copier has finally succeeded in series-manufacturing the item, he has merely demonstrated that, given time and effort, he can slavishly copy an existing design. He has not significantly enhanced his ability to design on his own. The prototype does not explain the rationale behind the original designer's choices. Every major design feature of a complex, modern piece of equipment is the outcome of a large number of engineering compromises and tradeoffs, the results of stress calculations, laboratory experiments, and functional tests. "Understanding" the design to the point that the copier can ultimately improve upon it means knowing why these compromises were made and how the tradeoffs were arrived at. The copier cannot learn this from studying the finished prototype. He must essentially retrace or reproduce the original designer's calculations and investigations. This is relatively easy if the copier is willing and able to obtain the original designer's assistance—his data and his experience. But the Chinese have systematically rejected such assistance throughout the post-Soviet period, rendering their problem far more difficult. Just how difficult will depend largely on the level of design experience and production know-how that the copier already possesses, i.e., the size of the technological gap that separates him from the originator.

The Chinese leaders are not unaware of these limitations. While they have sanctioned copying on a considerable scale and will no doubt continue to do so, they warn that excessive reliance on this form of acquisition would condemn China's technical level to permanent inferiority, "* * * because others are continuously advancing * * *. Purchasing sample machines from others can only be for the purpose of increasing our knowledge and knowing how others have taken their road. We cannot open up a road for ourselves merely by copying from others."[26] The Japanese are no doubt the past masters at finding the right combination of copying the designs of others and originating their own, and the proper evolutionary sequence in moving from one to the other. The Chinese seem to suffer by comparison, having both stronger ideological inhibitions against unrestricted copying and a weaker thrust toward developing design originality.

[26] Shen Hung, *Kuang-ming Jih-pao*, Apr. 8, 1965 (*SCMP*, No. 3441).

Importation of Complete Plants

Some of China's shortcomings in design and management technology may be gradually eased by another form of technology import, the turnkey production plant or comprehensive equipment package, complete with the technical data and advisory assistance to set it up. The Chinese resorted to this form of acquisition only on a modest scale in the post-Soviet period of the 1960's. The idea then was to set up such plants as models of ultramodern production technology which the Chinese would subsequently attempt to replicate. For example, in 1963 the Chinese purchased a 175,000-ton per year urea plant from The Netherlands. It was set up in Luchou (Szechwan) with Dutch technical assistance, with the express intention of having the Chinese build a duplicate on the spot. They hoped that by such a model-plant copying process they would be able to build up their own modern fertilizer production capacity to some 20 million tons within 10 years. The copying effort, however, turned out to be far more difficult technologically than they had expected, and the Chinese never did succeed in building a plant of anything like the capacity of the Luchou enterprise.

TABLE 3.—PRC PURCHASES OF COMPLETE PLANTS (CONTRACTS CONCLUDED JANUARY 1972 THROUGH MARCH 1975)

[Dollar amounts in millions of U.S. dollars]

By type of plant

Type of plant	Number of units	Estimated cost
Iron and steel plants		635
Rolling mills	5	
Iron works	1	
Power-generating plants		303
Complete stations	3	
Turbines and generators	46	
Petroleum exploration and extraction plants.		127
Offshore drilling platforms	4	
Oil rigs	2	
Survey and supply vessels	33	
Petrochemical and synthetic fibre plants		900
Intermediate product	33	
Synthetic fiber	11	
Chemical fertilizer plants		[1] 534
Ammonia	17	
Urea	15	
Other plants		133
Total		2,632

By country of origin

Country	Cost	Share (percent)
Japan	1,190	45
France	557	21
West Germany	405	15
United States	208	8
Italy	103	4
Netherlands	90	4
Union of Soviet Socialist Republics.	25	1
United Kingdom	25	1
Denmark	20	1
Belgium	5	Negligible
Sweden	4	Negligible
Total	2,632	100

Source: For details of sources and methods, see app. B, pp. 712–713.

[1] Excludes value of 4 1972 Japanese fertilizer plants for which no cost data are available; actual total, thus, may be some $50,000,000 to $60,000,000 higher.

Because of difficulties encountered in the 1960's, and because of the urgency of improving and expanding production in some key industries, the Chinese have shifted to a different strategy. They have now begun to import not a scattering of model plants, but entire industrial complexes, in some cases on a massive scale. Thus, since the Cultural Revolution, and especially in the past 2 years, the Chinese have entered an entirely new phase in their plant purchases. Table 3 gives an approximate breakdown of these purchases by type of plant and by country of origin. The purchases shown cover the period from January 1972 through March 1975 and represent contracts concluded, not plants delivered. Actual deliveries will be spread over a period of several years (in some cases as many as 4 years). Because the estimates are based on incomplete and often contradictory press and trade publication reports, they must be treated with some reserve.[27] Nevertheless, the table provides a fair indication of the major thrust of the plant acquisitions. They are centered on a few basic areas which are necessary for China's growth and for feeding and clothing its people: the industrial fundamentals of steel, power, and petroleum, and the all-important petrochemical industry—chemical fertilizers for agriculture, manmade fibers for the textile industry, and petroleum-based plastics for numerous purposes. All of the plants to be delivered are ultramodern and represent high-technology production equipment. In the few branches of industry they affect, the plants will enable China to "leap forward" in production efficiency and product quality.

The plant purchases, however, are not nearly broad enough. Many other branches of industry are equally in need of a technology transfusion, and appropriate plant acquisition could make a big difference. The automotive and aircraft industries are two cases in point.

In the automotive industry, China has only two reasonably large-scale production plants—Changchun and Nanking. These two produce at least two-thirds of the roughly 120,000 trucks China turns out annually. But the models they produce are ancient. They are replicas of the 30-year-old ZIS–150 and GAZ–51 models the Chinese inherited from parent plants in Moscow and Gorki through Soviet technology assistance in the midfifties. The Soviet models, in turn, were copies of trucks that the United States had provided the Russians under lend-lease in World War II. They are functional, of course, but grossly deficient in productivity, maintainability, and durability.[28]

Interestingly, among the large number—at least 3 dozen—of small-scale provincial truck plants described earlier the most advanced are able to manufacture trucks that are considerably more modern, with overhead valve gasoline engines and with higher compression diesels. However, these plants are amalgamations and mergers of small workshops or municipal repair shops, and thus cannot produce in significant volume (i.e., volume larger than a few thousand trucks per year).

The Chinese are keenly aware of their problem. They have been importing trucks in large numbers and in a variety of models from more than a dozen countries, but especially from France, Italy, Romania, Germany, and Japan. In 1973, they imported a record 16,000 from Japan alone, declining to a more normal 3,600 in 1974. This widely scattered importation is very costly, and the great diversity of models creates a nightmarish problem of maintenance, logistics, and spare parts supply. Moreover, to meet its massive needs for transportation and construction, China requires a much larger fleet of more capacious and efficient heavy vehicles. Importing a modern production plant would offer a relatively quick solution. Indeed, the Chinese have at various times been negotiating with Toyota for the possible purchase of a $380 million integrated automotive plant, and with Volks-

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[27] See appendix B for a complete listing of plants purchased.

[28] These deficiencies are reflected both in the performance indicators derived from Chinese truck specifications (compression ratios, fuel consumption, ratios of weight to horsepower, etc.) and in the observations of Western automotive experts who have toured Chinese plants.

wagen for the acquisition of a plant to manufacture the VW Safari Jeep. These acquisitions would constitute a tremendous jump in production and management technologies for the Chinese—at least as great as, if not greater than, the change in the Soviet automotive industry that followed the comparable Fiat-Togliatti plant transfer to the Soviet Union a few years ago. But it is not at all clear that the Chinese are as yet ready to make such comprehensive plant purchases in the automotive industry. For the moment, they seem to be limiting their purchases to specialized machinery and technology licenses that will selectively improve their ability to manufacture major components—such as roller and shell bearings, clutch and brake linings, fuel pumps and injectors—rather than seeking to modernize their entire industry in a more dramatic way.

What the Chinese lack is not the ability to manufacture. They manage quite well with custom-building, hand-machining, and small-scale batch-type production. What they have not mastered are the techniques of modern continuous-flow production processes, precise automation technology, and other organizational aspects of management technology. It is in these areas that package plant imports can be most helpful. The imports carry with them not only novel production systems and fabricating techniques, but also efficient plant layouts, flow patterns, embodied production organizations, and implicit management systems.

The aircraft industry is a second example of the potential value of such imports. In China, this industry is oriented almost entirely toward military production, but has not enjoyed a very high priority compared to certain other military industries. In the military sphere, the Chinese leadership has concentrated for many years on a rather narrow set of priorities.[29] These priorities might be reduced, somewhat too simply, to just three: nuclear weapons, rocket propulsion, and electronics—all self-evidently related. This concentration has meant that China was allowed to fall far behind in many other areas of military production. Aero-engines are a good example. China worked hard on airbreathing propulsion during the late 1950's and early 1960's, but the higher priority rocket propulsion field subsequently drew away some of the best scientists, engineers, and other scarce resources, leaving aero-engine technology in a state of retarded development. As a result, a big gap now separates China's aero-engine design and production capabilities (exemplified by the mid-fifties generation turbojets in their inherited, Soviet-designed fighters and medium bombers) from the sophisticated current generation turbofans of Rolls-Royce, Pratt & Whitney, and General Electric that power the major Western aircraft. Western aeronautical experts report that the Chinese themselves judge their aero-engine technology to be at least 20 years behind the West. Our own comparison of Chinese and Western turbine engines, in terms of the most relevant performance criteria, tends to support that judgment.[30] Such a substantial gap cannot be overcome by independent, incremental upgrading or by importing some advanced engines as prototypes for copying.

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[29] The narrowness of this concentration was already apparent in the 1950's. It is exemplified by the seven highest-priority fields of research singled out among the 57 "important tasks" listed in the Twelve-Year Science Plan (1955–67) adopted in mid-1956: atomic energy, semiconductors, electronics, computer science, automation, high-speed fluids, and turbine propulsion (Keiji Yamada, "The Development of Science and Technology in China: 1949–65," *The Developing Economies*, vol. 9, No. 4, December 1971, p. 518).

[30] See Hans Heymann, Jr., *China's Approach to Technology Acquisition: Part I—The Aircraft Industry*, R–573–ARPA, The Rand Corporation, February 1975, pp. 57–61.

As in the automotive industry, large advances can only come through direct technological assistance from abroad. Indeed, the Chinese have been negotiating with Rolls-Royce (1971) Ltd. to acquire licenses for unrestricted production rights for Rolls-Royce Spey engines, complete with extensive technical assistance from Rolls-Royce engineers. Acquiring that technology would in relatively short order bring the Chinese 10 years forward into the more advanced turbofan era of the early sixties. Accomplishing such a leap would require a considerable Chinese domestic investment effort in training and facilities and a gestation period of 2 or 3 years. Thus it would still leave the Chinese at least a dozen years behind the most advanced turbofans now operational in the West. Nevertheless, the practical consequences of the 10-year jump would mean a significant advance for their future aircraft performance. The relationship with Rolls-Royce, moreover, could be developed into a longer-term association, encompassing progressively more advanced levels of technology. In this way, the momentum of the effort would continue beyond the initial jump, and China's independent design and manufacturing capabilities would grow apace. This, however, would require a continuation of the present liberalizing trend in the Chinese leadership's interpretation of the "self-reliance" principle.

V. Problems and Prospects

From what has been described, it should be clear that China's potential economic gains from foreign technology are large and that its appetite for importing technology has grown considerably. Not only has there been a great spurt in the numbers of these imports; almost every day brings new reports of Chinese feelers, explorations, and contract discussions over an ever-widening range of technologies and processes. In the first 8 months of 1974, China concluded contracts for complete plants worth almost $750 million. Since that time, there has been a visible slowdown in contract closings, which may simply reflect a pause in the PRC's purchasing cycle, or some hesitation in the face of the current international economic disarray. The pause, however, is unlikely to be prolonged. The modernization drive is almost bound to continue on its own momentum.

The typical Chinese enterprise remains small; coal, power, iron and steel, machinery, and all forms of transportation equipment are produced in relatively small-scale, only partially modernized units whose output is uneven in quality. Now that the leadership has recognized the economic efficiency of large-scale undertakings and is moving seriously into advanced plant and equipment in some branches of heavy industry, the expansion of other branches must inevitably follow. Such a drastic change in the character of industrial production cannot be undertaken from the country's own resources alone. China must increasingly look abroad for assistance.

The task, however, is beset with problems. Three of these deserve brief comment.

One is simply the problem of absorptive capacity—but used here not in the usual sense of the ability fully to employ labor, but in the sense of the ability to absorb sophisticated capital. It is most critically a question of how to develop the higher echelons of skilled labor, design, and production engineers, technicians and supervisory personnel so essential to setting up and operating a modern plant. Many thousands of these will shortly be needed, as the bulk of the recently ordered plants come on stream in the next 3 years.[31] To assess the extent of the deficiency here is not easy. It might be argued, for example, that China experienced no serious problem of absorptive capacity during the 1950's, when the rate of technology transfer (primarily from the Soviet Union) was considerably larger in real terms than it is now, and when China's technical manpower resources were far smaller.[32] In the 1950's, however, the Soviet transfer of plant and equipment was accompanied by a vast transfer of human skills and educational services, for which there is no parallel today. Moreover, although China's policies of stressing industrial empiricism and mass education are effective in proliferating lower and mid-level skills, they are bound to affect the quality of advanced training. The conscious emphasis, especially since the Cultural Revolution, on practical experience, on "learning by doing," closing unversities for several years, and the proletarianizing reforms of tertiary education (reducing admission standards, shorting the curriculum) could not help but retard the development of a technical labor force with skills and educational standards comparable to those of the Western world. It takes decades to develop such a force, and a present deficiency could well act as a serious brake on China's rate of technological modernization. There is no indication that the post-Cultural Revolution educational reforms have begun to come to grips with this problem.[33]

A second problem that might constrain the expansion of China's technology import drive is ability to pay—ability to expand exports so as to earn the foreign exchange necessary to pay for imports. The Chinese have kept a close watch on the rate of inflation in the world market and adjusted their export prices sharply upward in 1973 to take full advantage of the new market conditions. But though they have greatly enlarged their range of exportable light industry manufactures, they are beset with materials shortages, capacity limitations, and transportation bottlenecks which will limit the rate at which exports can be expanded. At the same time, they have begun to feel the consequences of the world economic recession, in the form of a fall-off in demand for China's most important exports, such as textiles and light industrial products. Moreover, the relentless growth of China's population, no matter how successfully restrained, will continue for the foreseeable future, to require China to import large quantities of cereals, fertilizers, and other food-related raw products, imposing a persistent drain on its foreign exchange resources.[34]

In part, the Chinese have eased their problem by modifying their long-standing conservative payments policies. They have been willing to incur large trade deficits with some countries (notably a gaping deficit with the United States), and cover these by surpluses achieved with others (notably the less-developed countries of East Europe and

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[31] Some $800 million worth of plant are scheduled to be delivered during 1976, and some $1 billion during 1977. (For details, see appendix B.)

[32] Technical manpower in China is estimated to have increased from 2 million in 1952 to 7.3 million in 1971. See J. P. Emerson, "Administrative and Technical Manpower in the PRC." *International Population Reports,* Series P–95, No. 72, April 1973, p. 37.

[33] See Frederick C. Teiwes, "Before and After the Cultural Revolution," *The China Quarterly*, April–May 1974, pp. 332ff.

[34] For 1974, China appears to be suffering its first significant balance of payments deficit, amounting to perhaps $700–$800 million.

Asia). Also, they have been willing to accept "deferred payment" and "progress payment" terms, governmentally subsidized credit, and other schemes for low-interest borrowing.[35] They have been receiving every encouragement in this direction from the international financial community, especially from the Japanese. The latter have, for example, provided China with a large trade credit by opening a yuan account in the Bank of Japan and allowing China's yuan reserves to build up to as much as $1 billion, while holding down Japan's yen reserves in the Bank of China to less than $50 million.

In the longer run, however, China's export earnings will have to grow substantially if its imports are to continue to expand. A dramatic solution seems to be in sight: China's petroleum resources may well turn out to be the key to China's hard currency earning problem.

Thanks to an auspicious, if not prescient, energy investment policy that has for many years favored oil over coal, China finds itself now in the enviable position of being able to expand petroleum production drastically. Its vast proven onshore reserves have enabled China to increase the value of its exportable crude oil surpluses tenfold between 1973 and 1974 and to hold out the prospect to Japan of being able to supply it with 50 million tons of liquid fuel by 1980. At anything like current oil prices, that kind of export bonanza would surely avoid any foreseeable foreign exchange earning crunch. At the same time, it implies a rate of expansion of output that may not be achievable without assistance from abroad. The Chinese have demonstrated a remarkable ability to develop their onshore fields on their own, but a tripling or quadrupling of output over the next 6 years, as is apparently intended, would require not only very large quantities of high technology for exploration, extraction, and refining, but also a huge investment in transportation, including pipelines, barges, tankers, harbor improvements, and offshore loading facilities. The transportation problem could be eased if the Chinese shifted to offshore drilling, but this would require even more complex technology, and would almost certainly necessitate heavy resort to foreign expertise. There is an obvious circularity here: to expand technology imports, China must increase its exports: to expand exports, China must increase its technology imports.

A solution would be for China to enter into joint ventures or contingent service contracts with international petroleum exploration and drilling firms. The Chinese, however, have repeatedly and firmly rejected such a course. They evidently recognize that this would aggravate the third problem—the need for the Chinese to preserve at least something of their self-image of self-reliance.

A concluding word about this third problem:

To some Chinese, the intrusion of foreign influences must loom once again as a threat. With large-scale influxes of Western visitors, greater exposure of Chinese technicians and functionaries to capitalist ways abroad, reacceptance of the relevance of foreign expertise and technology to Chinese development, and the noticeable revival of the pragmatic Liuist line, the Maoists must be deeply disquieted as they seek to preserve the purity of the revolution. In the tradeoff between

[35] More than half of the plant purchases to date have been made on "deferred-payment" terms—typically a 20 percent down payment with the balance being paid off in semiannual payments over a 5-year period after the plant is completed; a 6-percent per annum interest charge is included in the purchase price.

ideologic and technologic, the trend of the last 2 years has been a steady and highly visible drift away from self-reliance and past policies of avoiding dependence, toward a more open, flexible relationship with the outside world. The Maoists can see this only as a threat of backsliding into revisionism.

The recent anti-Confucius-Lin Piao campaign is a reminder that the "struggle between the two lines" continues; and our earliest chart (see fig. 1 above) tells us that trends in technology policy can be reversed. For the moment, the xenophobic aspect of the campaign, the criticism of foreign things, has died down, and the emphasis is on party unity rather than on mass agitation. The existing policy seems firmly established, and current indications are that it will not be reversed. But who can be sure? The leadership must no doubt tread gingerly and avoid pushing the liberalizing trend too fast, lest what has been an educational campaign of purification turn into a purgative one. In shaping future technology policy, the leadership must view this danger both as a dilemma and a constraint.

APPENDIX A

FOREIGN INDUSTRIAL EXHIBITIONS IN CHINA, 1971–MARCH 1975

[By country, date, type, and location]

Country, date (Number of days)	National or specialized	Products and equipment exhibited	Location	Percent of display sold	Attendance	Number of firms
Austria: March–April 1974 (14)	National	Industrial: Steel electrical machinery, and chemicals. Austrian technicians held seminars attended by hundreds of Chinese technicians. (Largest Austrian exhibition ever held abroad.)	Peking		120,000	74
Australia: October 1974 (13)	do	Agricultural implements and methods, pedigreed livestock ($325,000 worth given to PRC); communications and transport equipment (including full-scale mockup of Nomad aircraft); mining equipment and development. Industrial raw materials, banking services. Equipment worth $2,000,000 was on display. Firms presented technical papers with lectures by experts in specific fields, discussion groups with Chinese engineers/technicans, seminars and technical firms. Estimated cost: $1,500,000 (largest and most complex Australian exhibition ever staged abroad).	do		170,000	100
Argentina: 1975 (planned)	do		do			
Belgium: Spring 1975 (planned)	do		do			70
Bulgaria: February 1972 (8)	Specialized	Medicine	do			
Canada:						
August–September 1972 (14)	National	Farm machinery, aircraft, electrical equipmentl heavy transport (Caterpillar-Gracil truck for work on rough terrain), model of Canadair CL–215 (firefighting aircraft), chemicals, forestry products, pharmaceuticals, mining equipment, logging machinery. 300 technical presentations given. Estimated cost: $2,000,000.	do		250,000	206
April 1974 (11)	Specialized	Electronic systems, components, and special devices, geophysical instruments, medical equipment, communications, laboratory and scientific instruments. All equipment highly sophisticated. (Sophistication of products allegedly eliminated danger of patent infringement, making copying extremely time-consuming—by time equipment could be copied newer models would be developed.) 93 seminars held on geophysics, medical and electronic instruments, industrial communications and aircraft electronics. Qualified end-users from all over China are believed to have attended seminars.	Shanghai (1st major trade fair held by Western nation outside Peking).	30–60	[2] 40,000	36
Denmark: [1]						
March 1972 (17)	National	Electronic instruments, food-processing equipment, machine tools, marine equipment (vessels and diesel engines), textile machinery, chemicals (insecticide and fertilizers), foundry equipment, cementmaking machinery.	Peking	75–80	100,000	50

August 1974 (10)	Specialized	Electronics. High-ranking CCPIT and Chinese electronic industry officials attended.	Shanghai	[3] 100	(2)	10
September 1974 (10)	do	Medical instruments	Peking			
East Germany:						
June 1973 (10)	do	Machine tools	Shanghai		30,000	
1974	do	Agricultural machinery	Shenyang			
1975 (planned)	do					
France:						
November–December 1972 (15)	National	Scientific and technical: aeronautics, electronics, metallurgy, and medical science.	Peking		50,000	
January 1973 (16)			Shanghai			
October 1973 (11)	Specialized	Scientific instruments (nuclear, radio-controlled measuring equipment, analytical instrumentation).	Peking		20,000	29
May–June 1974 (16)	National	Industrial: equipment for mining, aerospatial, and medical research, chemical and petrochemical industries, road transport, electronic data-processing equipment, chemicals, engineering and electrical equipment, transportation, public works and medical systems. Discussions held between Chinese and French technicians on 148 technical subjects.	do	[4] 50–60	200,000	270
Hungary:						
August 1971 (7)	Specialized	Medical instruments and medicine	do			
August 1972 (11)	do	Machinery and motor vehicles	Tientsin			
April 1974 (9)	do	Electrical lamps and instruments, thermal containers, enameling equipment.	Peking			
1975 (planned)	do	Machinery	do			
Italy: October 1972 (13)	National	Industrial: machine tools for woodwork, metalwork; plastic products; electromedical, scientific, and precision instruments; public and industrial transport. 60 technical conferences held, 40 scientific and technical films shown.	do		200,000	290
Japan:						
January 1972 (16)	Specialized	Precision electronic measuring instruments	Tientsin			13
March 1972 (13)	do	Machine tools	Shanghai			13
April 1972 (14)	do	Construction machinery. 130 technical seminars held	Tientsin		35,000	8
June–July 1973 (15)	do	Automatic, electronic, and medical equipment, computers, industrial robots, color television broadcasting systems. (28 items on display were on COCOM embargo list but were displayed with COCOM approval: Japan sought COCOM approval for planned sale of these.)	Peking		100,000	
November 1974	do	Agricultural machinery and fertilizer. Forestry products, livestock, fisheries, food processing, scientific research and engineering equipment. Sponsored by Japan Association for Promotion of International Trade.	do			200
Do	National	Printing and packaging. Demonstration of latest Japanese processes.	Tientsin			100
November 1975 (planned)	National, specialized	Industrial technology: this exhibition intended as showcase for most advanced Japanese technology; laser systems, electronic medical equipment, and advanced electronic computers. Teams of engineers and technicians to discuss technical subjects with Chinese experts from all over China. Over 600 exhibits (100 government, 500 commercial). Exhibition to include history of cultural exchanges between China and Japan during last 2,000 years. Sponsored jointly by Jetro and Japanese Government.	Peking			400–500

See footnotes at end of table, p. 711.

FOREIGN INDUSTRIAL EXHIBITIONS IN CHINA, 1971–MARCH 1975—Continued

[By country, date, type, and location]

Country, date (Number of days)	National or specialized	Products and equipment exhibited	Location	Percent of display sold	Attendance	Number of firms
Mexico: September 1974 (17)	National	General economic and trade exhibition. Display of minerals, textiles, foodstuffs, cotton, grain, iron and steel ingots, petrochemical products, plastics, transport machinery, optical instruments.	do			75
Netherlands: November–December 1973 (13).	do	Industrial technology: models of water conservation projects, port construction, shipbuilding and repair, electronic instruments, medical apparatus, products of chemical, machinebuilding, food-packing industries. Chinese and Dutch discussed 50 technical topics.	do		60,000	
Norway: March 1973 (5)	Specialized (single firm)	Exhibition-seminar by state-owned Kongsberg Vapenfabrikk (gas-turbine and industrial electronics manufacturer). Anticipated that PRC will manufacture firm's gas turbines and electronic equipment under license. Extensive discussions on technical problems between Chinese and Norwegian engineers.	do	100	([4])	
Poland:						
December 1974 (14)	Specialized	Building and mining machinery, engines (compression-ignition), heavy duty excavators, 35-ton crane, tractors, aircraft models, aircraft and automobile engines, models of complete plants.	do		50,000	
September 1974 (16)	do	Mining machinery and electrical equipment, motor vehicles and electronically controlled machines, Specialists gave lectures.	Tientsin		30,000	
Romania:						
October 1971 (14)	National	Industrial: artisan products, machine tools, precision instruments, vehicles, agricultural equipment, and petrochemical industry plant.	Peking		400,000	
August 1974	do	Electronic computers, telecommunications equipment				
Sweden: April 1972 (11)	do	Industrial: motor vehicles, mining equipment, optical instruments, medical apparatus.	Peking		200,000	147
Switzerland:						
August 1974 (12)	Specialized	Machine tools, watches, precision equipment, textile and printing machinery, chemicals, electrical and heavy machinery. Extensive meetings with Swiss Government and commercial representatives on finance, oil exploration, shipbuilding, steel mills. Chinese requested detailed blueprints of machinery on display.	do			200
United Kingdom: [6]						
March–April 1973 (13)	National	Industrial machinery and technology; avionics; instrumentation (flow and level measurement, metering and analytical instrumentation for lab and industrial uses, flight deck instruments, etc.); machine tools; semiconductors; computers (for use in	do	60–70	200,000	346

		Concorde project and Trident aircraft, civil engineering problems, planning and scheduling large projects with controlled systems, electronic components for control systems); telecommunications (television equiment and systems); petrochemical and agricultural chemical production; model of integrated rolling mill; plant for steel, nonferrous industries; petroleum refineries, power generation; advanced electronics and airport electrification; diesel engines; nuclear components to radar systems; mining equipment; equipment for underground civil engineering construction (e.g., tunnel boring). Focus of the exhibition was on new British industrial production and technology (many of the products/systems had never been displayed before). British conducted a program of 227 lectures and 63 industrial films (backed up by demonstrations and technical displays). Estimated cost: $2,500,000. This exhibition had been preceded in December 1972 by a 24-member trade mission to Peking which delivered 35 technical lectures of 3 hours each to several hundred technicians and engineers from all over China in the fields of aerospace, color television, xerography, chemicals, machine tools, pharmaceuticals, etc. Chinese advised British what they wished to see at the 1973 exhibit.			
March 1975 (10)	Specialized	Follow-up to 1973 exhibition with amplification of sectors which had aroused particular interest. Exhibition replete with range of sophisticated machine tools, numerical control systems used in milling, drilling, and cutting of metals, tube-sealing instruments which enable remote-control welding repairs to be made in thermal and nuclear boilers (this equipment also has uses in offshore oil drilling), marine survey equipment, medical and clinical instruments, electronic testing equipment. 300 company representatives took part in discussions, seminars, lectures and technical film presentations of their products.	Shanghai		60
West Germany:					
September 1975 (14)	National	Industrial	Peking		
Yugoslavia:					
December 1971 (15)	do	Industrial. Yugoslavs were able to meet 1,000 Chinese experts from various ministries and industries.	do	200,000	200

[1] First Danish exhibition in PRC was organized by a group of private electronic companies in 1965, followed by a government-sponsored industrial display in 1967. Denmark was last foreign country to stage an exhibition before Cultural Revolution and first one to do so after it.

[2] Invitation only.

[3] Estimated.

[4] Includes IRIS-60 computer and all data processing equipment.

[5] 500 seminars; 2,300 displays.

[6] For a more detailed listing of firms and technological equipment displayed at 1974 exhibition, see "China Trade and Economic Newsletter," March 1973.

Note: On Chinese side, exhibitions are handled by the Department of Foreign Exhibitions of the China Council for Promotion of International Trade (CCPIT). Foreign sponsorship may involve trading companies, industry associations, government agencies, e.g., Japan External Trade Organizations (JETRO), Association for Promotion of International Trade-Japan (JITPA), Danish Department of Trade and Industry, Swedish Export Association, Canadian Department of Trade, Industry and Commerce, Italian Ministry of Foreign Trade, Sino-British Trade Council, British Department of Trade and Industry, Austrian Federal Chamber of Commerce, Australian Department of Overseas Trade, National Federation of Electronic Industry (France), etc.

Sources: "China Trade Report," 1971–75; "Business Asia," 1973–75; "Asia Research Bulletin," 1971–75; "China Trade & Economic Newsletter," 1973–75; "U.S.-China Business Review," 1974–75

Appendix B

Industrial Plants and Major Components Purchased by the PRC, 1963–September 1974*

The table that follows attempts to provide as complete and accurate a compilation of industrial plant purchases by the PRC over the past dozen years as the available data permit. The compilation is arrayed by principal industry-group (iron and steel; power generating; petroleum exploration and extraction; petroleum refining, petrochemical, and synthetic fiber; chemical fertilizer; and other). Within each industry group, plant purchases are listed in chronological order by date of contract. Plants still under negotiation by September 1974 are listed in order of reported date of opening of negotiation.

Deciding which major purchases the category of "complete plants" should include or exclude was not easy. Basically, a restrictive definition was adopted: only purchases that covered an entire, integral manufacturing or production process or a complex of such processes were included. That meant excluding some quite large purchases of sets of equipment—in particular, $132 million worth of coal and ore mining equipment and $100 million worth of dredgers purchased by the Chinese during 1972 and 1973. While these must certainly be considered "productive plant," they seem to fall far short of being "complete plants." Two exceptions, however, were made: (1) sets of turbo-generators were included, even though they were not complete power generating plants, on the grounds that the turbo-generator represents quite obviously the technological heart of the power station; and (2) petroleum exploration and extraction equipment (offshore drilling platforms, oil rig supply vessels, survey craft, etc.), on the grounds that they constitute large and highly significant capital acquisitions in an industry that is currently of exceptional interest.

It should be noted that the data for the table were culled from a great variety of sources (see listing below); not all have a good track record of reliability, and they often feed on one another. Since the ultimate source of most of the information on these plant sales is the selling enterprise, and since these enterprises have understandable proprietary interests in protecting this information, or even in disassembling, independent verification is most difficult. In spite of considerable effort to reconcile discrepancies, eliminate duplication, and confirm claims, some questions of fact and interpretation remain unresolved.

An attempt was made to obtain consistent plant capacity figures. In the chemical fertilizer grouping, the capacity ratings are stated in metric tons per year (MT/yr). For the large plants purchased in the 1970s, these annual capacities are derived from an average *daily* output for (1) ammonia plants, of 1000 MT, and (2) urea plants, of 1600 MT, multiplied by 330 operating days per year. This is based on U.S. experience. If, under Chinese conditions, the plants should experience more days of down-time, the *annual* capacity would be correspondingly reduced. For the three urea plants in the 1974 Heurtey complex, the daily output rating is 1740 MT, rather than the 1600 MT for the other urea plants. The chemical fertilizer plants purchased in the 1960s, of course, have lower capacity ratings, since the technology of that period was less advanced.

The cost figures are probably subject to the largest margin of error, since it is not always clear to what extent royalty payments and license fees for technology are included, whether interest charges are fully reflected, what foreign exchange conversion rates should apply, and so forth. The conversion rates used were taken from the *FAO Trade Yearbook* volumes for the years through 1972, and reflect average rates of exchange for the floating exchange rate period of 1973–1974.

Following is a list of the principal sources used:

1. Asia Research Bulletin
2. Aviation Week & Space Technology
3. Business Asia
4. Business International
5. Business Week
6. China News Analysis

*The author is indebted to Jeanette Koch of The Rand Corporation for her painstaking compilation of the data and development of the format for this table. Valuable contributions to this effort were provided by Kim Morrissey of Rand. The author is grateful also to William Clark of the Bureau of East-West Trade, U.S. Department of Commerce, for advice on technical interpretation of the plant data, particularly in the petrochemical industry group.

7. China Trade Report
8. China Trade and Economic Newsletter
9. Christian Science Monitor
10. Current Background, American Consulate General, Hong Kong
11. Current Scene, The Green Pagoda Press, Ltd. (for United States Information Service, Hong Kong)
12. Economic Profile of Mainland China, Vols. 1 and 2, February 1967. Study prepared for Joint Economic Committee, U.S. Congress.
13. Electronic News
14. Far Eastern Economic Review
15. Far East Trade & Development
16. Japan Economic Journal
17. JETRO China Newsletter
18. PRC Daily Report, Foreign Broadcast Information Service (FBIS)
19. PRC: International Trade Handbook, Research Aid A–73–29, Central Intelligence Agency, October 1973
20. Ta Kung Pao
21. The New York Times
22. The Washington Post
23. Trade Yearbook, Vols. 19 (1965) and 25 (1971). Food and Agricultural Organization of the United Nations (FAO), Rome
24. Translations on People's Republic of China, U.S. Joint Publication Research Service (JPRS), Washington, D.C.
25. U.S.-China Business Review, National Council for U.S.-China Trade, Washington, D.C.
26. Vneshiaia torgovlia USSR, Statistichestkii obzor (Foreign Trade of the USSR, Statistical Survey) for 1972 and 1973, Moscow, 1973 and 1974.

TABLE B-1.—IRON AND STEEL PLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Cold-rolling mill (special steel) capacity NA	West Germany Schloemann AG, US 10,000,000 (subsidiary of Gutehoffnungshutte AV).	1965–Early 1966		17.0	
	France, Sino-France				
Steel mill (Linz-Donau)—Capacity: 650,000 MT/yr raw steel; location: Taiyuan (Shansi) iron and steel industrial park.	Austria VOEST	1965	1966–68	12.0	Negotiations began in 1963. VOEST is originator of basic oxygen furance (BOF). Plant was assembled by Chinese; West German engineers and Austrian technicians participated in supervising assembly. 2 55-ton oxygen furnaces reported put into operation in 1969.
Pipe and tube-drawing plant—capacity: NA.	Italy	1965		3.0	
Seamless steel tube plant—capacity: NA.	Italy, Innocenti	September 1965		3.2	Payment: 10 percent down; balance on completion.
Wire-drawing plant—capacity: NA	Japan	1965		5.0	
Steel tube plant—capacity: 40,000 MT/yr.	United Kingdom: Lowey Engineering, Ltd. US$6,000,000 (in cooperation with Mannesman of West Germany).	1967	1968	11.0	Lowey canceled contract reportedly under pressure from United States, but Mannesman shipped plant and equipment in 1968.
Iron works—capacity: NA	Japan: Hitachi Engineering	1972			It is not clear whether this is an iron foundry or blast furnaces for making pig iron.
Small steel mill—capacity: NA	Japan: Sumitomo Metal	1972		5.24	This may be a continuous-casting plant.
Steel-rolling mill—capacity: NA	West Germany: Demag AG	1972		80.0	
Steel complex—Capacity: 4,000,000 MT/yr.	West Germany: Mannesman AG, Thyssen.			408.0	Under negotiation as of January 1974.
Iron and steel complex—Location: Wuhan (Cold-rolled steel sheet, strip and finishing department. Cold strip mill with facilities for tinning, silicon steel and possibly galvanized sheet. Tinning plant	West Germany: Demag AG; Schloemann AG; Siemag Siegener Maschinenbau GmbH; ACEC (Belgian sub. of Westinghouse Electric); Allgemeine Elektrizitäts-Gesellschaften AEG-Telefunken; Au-	March 1974	1976–77	198.0	Terms: All cash. PRC to transfer 90 percent of purchase price in DM to Deustche Bank/Duisburg. From this, 10 percent down payment to be released initially; another 10 percent instalment after 9–10 months; remaining 70 percent staggered over 13th through 33d month. Final 10 percent to be released in 2 5 percent instalments. First instalment after

probably supplied under Nippon contract.) (See next item.)	gust Thyssen-Hütte AG-Rasselstein AG; Brown, Boverie & Cie AG (sub of Brown, Boverie & Cie (Switz.); DSD, Dillinger Stahlbau GmbH; Gewerkschaft Kermachemie; Hochtief AG für Hoch- und Tiefbauten, Vorm. Gebr. Helfmann; Otto Wolff AG Maschinenfabrik, Sack GmbH; Siemens AG, Waagner-Biro AG (Austrian sub of Österreichische Länderbank AG), Ed. Zublin AG; Bauunternehmung.				performance tests concluded and material guarantees verified in 1977. Final instalment no later than March 1979. Training: Germans to train 170 technicians in West Germany and other European steel plants. 230 German specialists to be sent to Wuhan. Total steel complex (including Nippon contract below) will reportedly add 25 percent to Chinese rolled steel capacity. Negotiations between Chinese & Demag, Siemag, & Schloemann for large-scale steel-rolling mill date to 1966, but were broken off in 1968 reportedly under U.S. pressure.
Hot-rolled steel-sheet and strip Mill department, 1 hot-strip mill—Capacity: 3,000,000 MT/yr, Contract includes silicon steel-sheet mill (capacity: 70,000 MT/yr) and tinning plant (capacity: 100,000 MT/yr) probably for cold strip mill department.	Japan: Nippon Steel Mitsubishi Heavy Ind.; Ishikawajima-Harima Heavy Ind. (IHI); Toshiba; Hitachi; Mitsubishi Electric (plus 10 other Japanese firms).	May–June 1974	1975–77	228.5	Contract denominated and payable in yen (previous contracts have been denominated and payable in yuan), and includes $15,600,000 worth of technology. Terms: 10 percent deposit; 20 percent to be paid on shipment and 10 percent when trial operations commence; remaining 60 percent reportedly to be paid under a deferred-payments arrangement. Training: About 350 Japanese experts will live near site during construction and startup period, over 200 Chinese technicians will be trained at 3 major Nippon Steel plants at Oita, Kimitsu, and Hirohata.
Surface water recirculation and disposal plant—Transformers, Desulfurization plant for coke oven gas, Related steel construction materials and pipe.	Japan: Kurita Water Industries; Chiyoda Chemical Engineering and Construction.	October 1974		65.0	This plant and equipment is for above Nippon Steel mill; total value of contract is reported to be $100,000,000 (of which $65,000,000 has been obligated). Drainage disposal system is estimated at $32,500,000. Terms: Assumed to be the same as for the Nippon Steel mill.
Continuous casting mill—Capacity: 1,500,000 MT/yr alloyed and unalloyed steel (includes 3 ingot slab casting machines of circular arch construction type).	West Germany: Demag AG; Mannesman (Düsseldorf); Switzerland: Con-Cast (Zurich).	October 1974	1977	58.0	Part of the major integrated steel complex being built at Wuhan. Terms: Progress payments.

TABLE B-2.—POWERPLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Thermal electric powerplant—1 steam turbine, 1 thermal generator, 1 oxygen generator.	Japan: Mitsubishi Electric; Hitachi Engineering; Toshiba.	Early 1972		13.0	
Thermal electric power plant(s) Total capacity: 300 MW, 4 steam turbo-generators.	U.S.S.R.	1972	1972	8.2	
Thermal generator (1)—Capacity: NA	Italy: Gruppo Industrie; Electromechnichi per Impianti all' Estero (GIE).	1972		1.7	It is not clear what equipment was involved in contract.
Gas turbine generators (5)—Capacity (each): 25 MW, (Model PG 5331), Ancillary equipment.	United Kingdom: John Brown Engineering, Ltd.	June 1972	1972 (2d half)	8.4	Cash payment. Sets to be modified for use in China; river water to be used for lube oil cooling.
Hydroelectric powerplant—Capacity: NA, 3 complete generating sets.	Sweden: Karlstade Mekaniska (Verkstaeder & ASEA).	July 1972	June 1973 (in operation 1st half 1974).	4.0	
Thermal electric powerplant—Total capacity: 250 MW, 2 steam turbines (125 MW each), 2 generators, electrical control gear, high pressure water supply pump, valves and other auxiliary equipment (except boilers).	Japan: Hitachi Engineering	August 1972	April 1974, for equipment.	30.0	Quoted in yuan; cash payment in sterling. This is first plant of its kind Japan has exported to PRC, also biggest industrial plant exported under Japanese/Chinese Memorandum Trade Program. In 1972 it was reported that plant would be largest of its type in China; it will go into operation spring 1975.
Hydroelectric powerplants (2)—Capacity (each): 75 MW, 2 turbines.	France: Alsthom Compagnie (Francais-Thomson-Houston-Hotchkiss-Brandt SA); and Ste Creusot-Loire (Schneider SA).	December 1972	1974–75	10.0	
Thermal electric powerplant(s)—Capacity (each): 700 MW, 7 steam turbo-generators.	U.S.S.R.	1972	1973	16.38	

Power-generating plant—Capacity: NA.	Switzerland	1972–73			
Thermal electric powerplant (Coal-burning)—Total capacity: 500 MW, 2 steam turbines (250 MW each). 2 generators, electrical control gear high pressure water supply pumps, valves, piping and other equipment (except boilers).	Japan: Hitachi Engineering	September 1973	1974–75	72.0	Financing: Japanese Eximbank. 10 percent down payment (on signing of contract); 15 percent at time of shipment; 5 percent on completion of guarantee period (or 28 months after shipment); balance (70 percent) in 10 instalments at 6 percent over 5.5-year period.
Gas turbine generators (5)—Capacity (each): 25 MW. Modifications include river water for lube oil cooling and a rearrangement of exhaust system.	United Kingdom: John Brown Engineering, Ltd.	1973 (fall)		8.2	
Thermal electric power plant—Capacity: NA, 3 gas turbines, 3 electric generators.	Belgium: Ateliers de Construction Electrique de Charleroi (ACEC) (generators). Canada Westinghouse (turbines)	1973	1975	5.0	
Thermal electric powerplant (oil-fired)—Total capacity: 650 MW, 2 turbogenerators (325 MW each).	Italy: Gruppo Industrie Electromechnichi per Impianti all'Estero (GIE).	March 1973		86.2	Terms: 5 years at 6 percent.
Thermal electric powerplant (coal-fired)—Total capacity: 300 MW, includes single valve steam generator, heated with soft coal and auxiliary machinery.	France: Compagnie Electro-mechanique; Switzerland Brown Boverie Group Gebrueder/Sulzer Aktiengesellschaft (Winterthur).	May 1974	1976 (operational)	40.0	Includes equipment, technology and advisory personnel for installing and setting plant in operation. CEM is responsible for technical and commercial side of power station, Sulzer for boiler supplies and engineering.
Turbo-alternators (3)—Capacity (each): 100 MW.	Czechoslovakia: Skoda export	1972–73	April 1974		Machine tested in presence Chinese engineers before shipment (to Nanking).

TABLE B-3.—PETROLEUM EXPLORATION AND EXTRACTION PLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Oil-drilling equipment—Capacity: NA	France	1965		4.86	
Offshore drilling platforms—Capacity: 400 tons, second-hand barge Fuji, tenders, and parts, Work ship Kuroshio.	Japan: Nippon Kaiyo Kussaku; Japan Offshore Drilling Co. (Mitsubishi).	September 1972	March 1973	9.8	
Offshore drilling platform—No. 2 Hakuryu (heavy duty).	Japan: Mitsubishi Heavy Industries	December 1973	1975	22.6	Operable up to 20 meters deep. For development of oilfield on continental shelf, Yellow Sea to South China Sea.
Offshore drilling platforms (2)	Japan: Japan Oil Development Corp. (Mitsubishi).	1973(?)	1973	41.0	Reported as oil drilling and exploration ships.
Oil rig/supply and towing vessels (8)—(160 feet long).	Denmark: Weco Shipping, Aarhus Flydedok A/S.	Late 1973	1974–75	20.0	Vessel can service up to 10 rigs. Reportedly for use in Pohai Gulf.
Oil rig supply vessels (5)	Japan: Mitsui Shipbuilding & Engineering.				Under negotiation.
Supply boats (Diesel) (5)—Capacity (each): 660 tons.	Japan: Hitachi Shipbuilding & Engineering.	September 1973		10.0	For maintenance and repair of port facilities and for developing offshore oil; will be fitted with rescue & firefighting equipment.
Tugboats (2)—Capacity (each): 9,000 hp; capacity (pulling): 82 tons.		December 1973	1975	16.7	
Undersea survey craft (2) and 500-ton survey ship.	Japan: Sumitomo Shoji, Ocean Systems (Japan), Niigata Engineering.				Under negotiation.
Supply boats (8) for offshore drilling	Denmark: Weco Shipping	1974			
Data processing center—2 Control Data cyber 172 computer systems (medium scale) and all equipment necessary for seismic data collecting and processing.	France: Compagnie Générale de Géophysique (CGG), Control Data/France.	September 1974		7.0	For coordination of development of China's oilfields. Application of software, system integration, training of Chinese technicians, and other support services to be completed in France. These are largest computers yet sought by PRC.
Ship completely equipped for marine seismic surveys.	France: Compagnie Générale de Géophysique (CGG).	Prior to September 1974.			

TABLE B-4.—PETROLEUM REFINING, PETROCHEMICAL, AND SYNTHETIC FIBRE PLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Ethylene, hexanol and butanol plants (2)—Capacity: 300,000 MT/yr.	France: Melle & Speichem	1963		8.50	
Vinylon fiber plant—Capacity: 11,000 MT/yr.	Japan: Kurashiki Rayon	September 1963	1974	20.0	
Vinylon plant—Capacity: 18,000 MT/yr.	Japan: Dai Nippon		1963	30.0	
Oil refinery—Capacity: 150,000–200,000 MT/yr.	Italy: ENI Group	December 1963		5.0	
Acetylene gas generating plant—Capacity: 1,100 cu m/yr.	Japan	May 1964	1967	3.0	Complements 1963 Kurashiki vinylon plant (see above).
Perlon (synthetic fiber) plant—Capacity: NA; Location: Shanghai (suburbs).	West Germany: Friedricht Uhde, GmbH.	July 1964		1.75	Terms: Cash on delivery.
Heavy crude-oil-cracking and olefins-separation plant—Capacity: 50,000 MT/yr, Location: Lanchow.	West Germany: Lurgi-Gesellschaft	July 1964	1968	12.5	Terms: Cash.
High-pressure polyethylene plant—Capacity: 24,000 MT/yr.	United Kingdom: Simon Carves, Ltd.	September 1964		12.6	Plant uses ethylene produced by olefins-separation plant purchased from Lurgi-Gesellschaft (see above).
Polypropylene plant—Capacity: NA	United Kingdom	November 1964		7.3	Both resin and fiber products to be made from propylene produced by Lurgi-Gesellschaft olefins-separation plant.
Acrylonitrile plant—Capacity: 10,000 MT/yr.	West Germany: Lurgi-Gesellschaft	May 1965	1967	11.0	
Naphtha-cracking plant—Capacity: NA	Norway	July 1965		14.0	
Polyester resin plant—Capacity: NA	United Kingdom: Scott Bader	1963–65			
Acrylic resin plant—Capacity: NA, Location: Lanchow.	United Kingdom: Prinex, Ltd (affiliate of Courtaulds, Ltd).	September 1965	1968	8.4	Terms: 10 percent down. Majority of outstanding balance to be paid by promissory notes with 5-year usance, except for a small part to be paid on completion of project; 2-year credit also extended. Service and parts replacement agreement included in contract.
Oil refinery—Capacity: NA	Italy: Snam Projetti (ENI Group)	September 1965		9.0	
Aromatic chemicals plant—Capacity: 70,000 MT/yr.	Italy: Snam Projetti (ENI Group)	1966		5.5	
Vinylon plant—Capacity: NA	Japan: Kuraray	June 1972			Financing: Japanese Eximbank (1st instance of financing of China trade by Japanese Eximbank). Authorized by decree of July 26, 1972, which nullified "Yoshida Letter" banning use of Bank funds in China trade because of Taiwan.
Chemical fiber plant—Capacity: NA	Japan: Kurashiki Rayon Co.	July 1972		18.9	
Ethylene plant (1)—Capacity: 300,000 MT/yr, Technology: Lummus	Japan: Toyo Engineering Co. (TEC); Mitsui Toatsu Chemical; C. Itoh; Toko Bussan. United States: Lummus Co.	December 1972	1973–late 1975	46.0	Financing: Japanese Exim/Commercial Bank. FOB 20 percent down; 80 percent deferred payment over 5 years at 6 percent per year on completion of plant. Contract calls for package of yuan and yen, TEC receiving yen and Lummus

TABLE B-4.—PETROLEUM REFINING, PETROCHEMICAL, AND SYNTHETIC FIBRE PLANTS—Continued

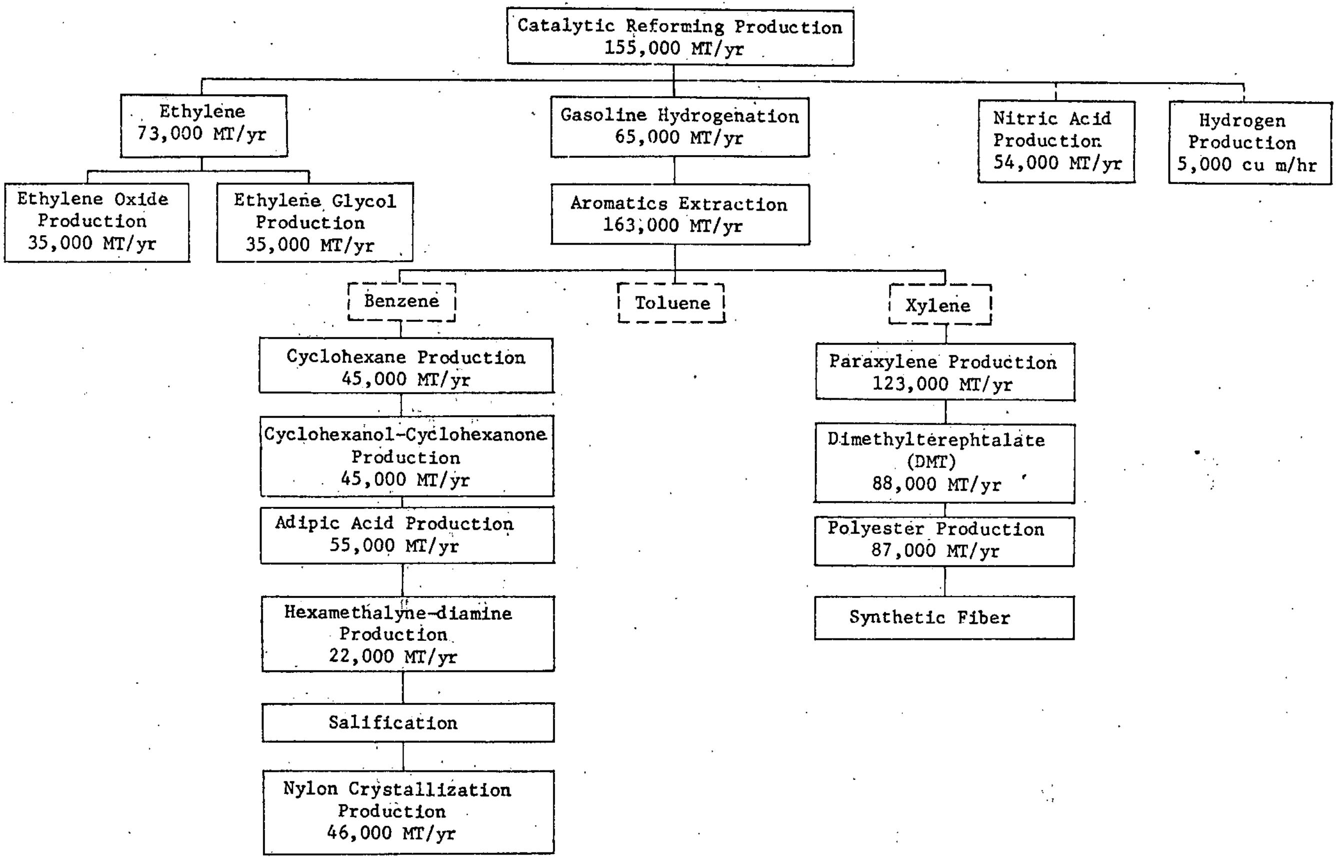
Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Butadiene plant (1)—Capacity: 45,000 MT/yr, Technology: Nippon-Zeon.					receiving payment through Japanese licensee. Contracted for and payable in yuan. Technical assistance fee 10 percent. (Lummus is subsidiary of U.S.-based Combustion Engineering Co.; TEC-Lummus arrangement dates back 10 years, calls for basic engineering and technical assistance.) Lummus received U.S. Department of Commerce license and clearance.
Synthetic fiber plant—Capacity: NA	Japan: Toray Industries	1972		90.0	
Acetic acid plant—Capacity: NA	Japan: Kaisha	1972			
Ethylene and polyvinyl alcohol (poval) plant—Capacity: 120,000 MT/yr, Technology: Lummus/Nippon-Zeon; ethylene plant has hydrogenation unit for oil cracking; plant uses kerosene, diesel, other type oils instead of naphtha.	Japan: Mitsubishi Petrochem; Mitsubishi Heavy Ind., Mitsubishi Corp.; Western Japan Trading; United States: Lummus.	February 1973	End 1973–75	34.0	Financing: Japanese Ex-Im/Commercial Bank. 20 percent down, 80 percent over 5 years at 6 percent p.a.
Ethylene vinyl acetate plant (1)—Capacity: 66,000 MT/yr. Polyvinylacohol (poval) plant (1)—Capacity: 33,000 MT/yr; Technology: Bayer & Kuraray.	Japan: Kuraray Industries; West Germany: Bayer.	March 1973	1974–76	26.0	Financing: Japanese Ex-Im/Commercial Bank. 30 percent down payment; 70 percent in 10 semiannual installments (in yuan) over 5 years at 6 percent per year beginning after final shipment. Bayer receiving lump sum payment directly from PRC. (In 1963 Kuraray sold PRC a vinylon plant with capacity of 11,000 MT/yr. Terms were 25 percent down, 6 percent per year for 5 years with export restriction imposed on PRC for 10 years after startup.)
Synthetic fibre plant complex—Acrylonitrile plant—Capacity: 50,000 MT/yr; Acetonitrile plant—Capacity: 1,000 MT/yr; Cyanic acid plant—Capacity: 5,000 MT/yr; Waste-water treatment plant—Technology: Asahi/Sohio Contract provides for supply of Sohio Catalyst 41 for new plants. Will give PRC one of world's most modern waste-reducing techniques, increasing production 40–50 percent over earlier generation catalysts.	Japan: Asahi Chemical Co.; Niigata Engineering; Asaki Chemcial Ind.; Chori Trading Co.; United States; Sohio.	March 1973	1974–76	29.0	Not including license fee. Financing: Japanese Ex-Im bank. Semiannual installments over 5 years at 6 percent per year in yuan. Extra payment by PRC of US $8,000,000 direct to Sohio, channeled through Japanese Bank; 7 installments over 5 years; first payment due 60 days after contract is approved by Japanese Government, followed by payments in August-September 1973 and 4 annual payments 1974–77, adjusted to inflation. PRC bought process, license, and plant as single unit; license does not call for free exchange of future improvements in Sohio technology. PRC may export plant's output. Training: Asahi responsible for training Chinese engineers in Japan. No Sohio engineers involved in setting up plant or its operation.

Polyester polymerization plant (1)—Capacity: 25,000 MT/yr; Technology: Toray-based on improved Imperial Chemical Industries (ICI) process.	Japan: Toray Industries; Mitsui Shipbuilding.	May 1973	1974–76	49.0	Financing: Japanese Ex-Im/Commercial Bank.
Aromatic extraction plant (1) (Benzol-toluol-xylol) (BTX)—Capacity: 50,-0C0–60,000 MT/yr; Technology: Universal Oil Products.	Japan: Sumitomo Chemical	May 1973	1974–76	6.0	Financing: Japanese Ex-Im/Commercial Bank.
Vinyl acetate plant (1)—Capacity: 90,000 MT/yr; (Derived from natural gas).	France: Speichem, Lurgi Virg.; L'Aire Liquide; Rhone-Poulenc; United Kingdom: Humphrey & Glasgow West; Germany: Badische Anilin und Soda Fabrik (BASF).	May 1973	1974–76	90.0 including technology.	Probably deferred payments over 5 years. Synthetic fibers indicated as end-use.
Methanol plant (1)—Capacity: 300 MT/day; Technology: Plant uses residual gas from acetylene production; will employ ICI low pressure synthesis method and an Onia catalytic particle oxidation process licensed by P.E.C. Engineering of Paris.					
Polyethylene plant (1)—Capacity: 60,000 MT/yr; Technology: Based on improved version of high pressure process (BASF) imported from West Germany.	Japan: Mitsubishi Petrochem.; Hitachi, Ltd; Chori Trading Co.; Western Japan Trading.	July 1973	1974–75	22.0	Financing: Japanese Ex-Im/Commercial Bank. Deferred payment over 5 years at 6 percent per yr.
Acetaldehyde plant (1)—Capacity: 30,000 MT/yr; technology: Uhde & Hoechst; location: Near Shanghai.	West Germany: Friedrich Uhde & Farbwerke Hoechst.	July 1973	1974–75	4.0	Terms: Cash. 50 percent down, 40 percent on delivery, 10 percent on acceptance.
Polyethylene plant (1) (High pressure, low density) Capacity: 180,000 MT/yr; technology: Based on improved version of ICI process.	Japan: Sumitomo Chemical; Ishikawajima-Harima Heavy Industries.	August 1973	1974–76	41.0	Financing: Japanese Ex-Im/Commercial Bank.
Petrochemical and synthetic-fiber complex (16 of 18 units)—Capacity: initial, 500,000 MT/yr; full, 2 million MT/yr; location, 50 km south of Shenyang.	France: Technip-Speichem Consortium; Some West German and U.S. technology.	September 1973	1975–78	282.0	Construction to begin in March 1975. Output for PRC consumption only. Financing: Crédit Lyonnais, Banque de L'Union Européenne, and Banque Française pour le Commerce Exterieur. Deferred payment over 5 years after delivery of plant.

ORGANIZATION OF THE PETROCHEMICAL AND SYNTHETIC-FIBER COMPLEX [1]

Production	Capacity	Technology
Catalytic reforming	155,000 metric ton per year	
Hydrogen	5,000 cubic meter per hour	Technip.
Ethylene	73,000 metric ton per year	Institut Français de Pétroi (IFP) & Speichem.
Ethylene oxidation process	35,000 metric ton per year	Chemische Werke Huls (CWH).
Ethylene glycol	35,000 metric ton per year	Chemische Werke Huls (CWH).
Gasoline hydrogenation	65,000 metric ton per year	IFP & Speichem.
Aromatics extraction	163,000 metric ton per year	IPP.
Paraxylene	123,000 metric ton per year	Atlantic Richfield Engelhard.
Dimethylterephtalate	88,000 metric ton per year	Dynamit Nobel.
Polyester	87,000 metric ton per year	Rhône Poulenc.
Nitric acid	54,000 metric ton per year	Rhône Progel.
Cyclohexane	45,000 metric ton per year	IFP.
Cyclohexanol-cyclohexanone	45,000 metric ton per year	Société des Usines chimique Rhône Poulenc (SUCRP).
Adipic acid	55,000 metric ton per year	SUCRP.
Hexamethalyne-diamine	22,000 metric ton per year	SUCRP.
Salification		SUCRP.
Nylon Crystallization	46,000 metric ton per yeat	SUCRP.

[1] Figure below is a flow chart of the petrochemical and synthetic-fiber complex.



Flow chart for the petrochemical and synthetic-fiber complex

TABLE B-4.—PETROLEUM REFINING, PETROCHEMICAL, AND SYNTHETIC FIBER PLANTS—Continued

Plant profile	Country and firm	Contract signed	Delivery period	Value (million US$)	Remarks
Petrochemical plant (1) (for production of polypropylene)—Capacity, 35,000 MT/yr.	Italy: Snam Projetti (ENI Group);	1973	1975–77	15.0	Financing: Cash. Normal terms. Snam Projetti is responsible for entire project. Standard Oil will train technicians.
Technology, Standard Oil of Indiana	United States: Standard Oil of Indiana.				
Polypropylene plant—Capacity, 80,000 MT/yr; technology, Mitsui Petrochemical plant is part of chain of derivatives of TEC/Mitsui 300,000-ton ethylene plant (see above). Design, engineering, manufacturing, and procurement of equipment for plant by Mitsui Shipbuilding.	Japan: Mitsui Petrochemical; C. Itoh; Mitsui Shipbuilding & Engineering; Kosho Trading Corp.	October 1973	1974–76	26.0	Contract suspended at request of Japanese consortium in early 1974. Explanation given: competing domestic demands in Japan. Would have enabled PRC to produce polypropylene for first time.
Catalyzer production plant for production of titanium trichloride (catalyst for polymerization of polypropylene)—Capacity, 220 MT/yr.	C. Itoh; Toho Titanium; Kosho Trading Corp.	January 1974	1974–end of 1976	4.6	First such plant sold to PRC.
Vinylchloride monomer plant—Capacity: NA.	West Germany: Friedrich Uhde	January 1974	1976	19.0	

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Ethylene-glycol plant—Capacity, 16,000 MT/yr.	Japan: Hitachi Shipbuilding:	December 1973	1977	17.0	Financing: Japan Ex-Im/Commercial Bank. 25 percent down; 5-year deferred payment at 6 percent p.a.
Ethylene-oxide plant—Capacity, 20,000 MT/yr.	Japan Catalytic Chem.; Nippon Shokubai Kagaku (engineering); Nisso Petrochemical.				
Polyester spinning and stretching plant 2 polyester staple machines—Capacity, 13,200 MT/yr long and short polyester fibers, 1 8-ton filament machine and related facilities—Capacity, 26,401 MT/yr filament.	Japan: Teijin; Nissho-Iwai Co., Ltd	February 1974	1975–76	17.0	Financing: Japanese Ex-Im. Contract denominated and payable in yuan. Cost includes know-how and engineering. 35 percent down payment with 65 percent balance to be paid in equal installments over 5-year period. Complements raw materials plant purchased May 1973 from Toray.
Acrylic fiber plant—Capacity: NA	Japan: Japan Exlan; Ataka Trading Co				Under negotiation in March 1974.
Synthetic rubber plant—Capacity; NA	Canada: Polysar			20.0	Under negotiation in March 1974.
Polyvinyl alcohol plant—Capacity: 45,000 MT/yr.	Japan: Kuraray	February 1974	1976	19.0	Financing: Japanese Eximbank. 15 percent down, balance to be paid over 5 years at 6.5 percent annual interest. Chinese will use plant for production of vinyl using Chinese technology. Complex may include an acetic acid vinyl plant.
Polyethelene plant (high density low pressure).	West Germany: Friedrich Uhde	March 1974	1975–76	15.7	Cost includes engineering, installation, and equipment.
Nylon spinning plant (design and equipment)—Location: Manchuria, Capacity: NA.	France: Rhone Poulenc Textile	August	1977–78	10.0	Deferred payment terms.
Polyvinyl alcohol plant—Capacity: 45,000 MT/yr; location: Chungking.	Japan: Kuraray	October 1974	1975–76	18.0	Financing: Japanese Eximbank (partial) 15 percent down, remainder over 7–8 years at 6.5 percent annual interest.

TABLE B-5.—CHEMICAL FERTILIZER PLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million U.S. Dollar)	Remarks
Synthetic ammonia plant: Capacity, 105,000 MT per year; location; Lu-chou.	United Kingdom: Humphrey & Glasgow, Ltd.	October 1963	1966	8.4	Progress payments with final payment 6 mo after test operation No special agreement on technology although separate provision made for use of British engineers. This plant intended to complement Dutch Stork-Werkspoor plant (see immediately below).
Urea plant; capacity; 175,000 MT per year	Netherlands: Stork-Werkspoor	September 1963	1966	7.0	
Ammonium nitrate plant: Capacity; 110,000 MT per year.	Italy: Montecattini	December 1963		14.2	Plant purchased by PRC for Albania. Contract includes facilities for production of ammonia, nitric acid, and ammonium nitrate fertilizer.
Synthetic ammonia plant: Capacity; NA	Italy	do		3.6	Compression chamber only; remainder of plant built by Chinese.
Ammonia plants (4): Capacity; 40,000 MT per year (each).	United Kingdom: Humphrey & Glasgow, Ltd.	August 1965		23.52	
Fertilizer plant: Capacity; 150,000 MT per year.	Italy: Montecattini		1965	7.5	
Chemical fertilizer plants (2): Capacity; NA.	Japan: Kagaku; Mitsui Toso Trading.	April 1972			
Ammonia plants (2): Capacity; NA	Japan: Hitachi Shipbuilding; Nippon Shokubo; Kagaku Haishu.	1972			
Urea plant complex (3 plants): Capacity (each), 480,000 MT per year; technology; Dutch State Mines (DSM) Stamicarbon process.	Netherlands: Kellogg Continental (51% owned by M. W. Kellogg, division of U.S. Pullman, Inc.); Verenigde Machinefabrieken.	January 1973	1st plant in 1976, 2d plant in mid-1976, 3d plant 6 mo. later.	34.0	DSM to get lump-sum payment in guilders; balance spread over 4 yr with major amount payable in 1st 2 yr. Contract covers FOB cost plus supervision of erection, including basic design, supply of all equipment, construction work, and necessary guidance during initial production stage. Training: DSM to train 40 to 50 Chinese technicians in Holland; will send technicians for erection and start-up of each plant.

Fertilizer plant complex: 1 ammonia plant; Capacity, 330,000 MT per year. 1 urea plant; Capacity: 528,000 MT per year. 1 waste water treatment plant other auxiliary equipment. Technology: Kellogg/Mitsui Toatsu.	Japan: Toyo Engineering; Mitsui Toatsu Chemical; Mitsui & Co.; Hiroshima Trading Co.	April 1973	1975	42.0	Financing: Japanese Ex-Im Commercial Bank. 20 percent down payment; 80 percent in 10 semi-annual instalments over 5 yr at 6 percent per year, payable in yuan. Kellogg to receive payment through Japanese licensee.
Ammonia plant complex (3 plants): Capacity (each); 330,000 MT per year; Technology: Kellogg.	United States: M. W. Kellogg	March 1973	1976	70.0	Spot cash, no financing involved. Normal terms: Approximately 20 percent down, 70 percent on completion; 10 percent on start-up.
Urea plant complex (5 plants): Capacity, 480,000 MT per year; Technology: DSM stamicarbon.	Netherlands: Kellogg Continental (joint venture of M.W. Kellogg (United States) and Verenigde Machinefabrieken).	August 1973	1975–77	56.0	1st plant in operation in 1976–77; others following at 3-mo. intervals.
Fertilizer complex: 1 ammonia plant; capacity, 330,000 MT per year. 1 urea plant; Capacity: 528, 000 MT per year; Technology; Kellogg.	Japan: Mitsui Toatsu Chemical; Toyo Engineering.	August 1973	1976	42.0	Financing: Japanese Ex-Im Bank. 20 percent down payment, 80 percent in 10 semiannual installments over 5 yr at 6 percent per year, payable in yuan. Kellogg to receive payment through Japanese licensee as in previous TEC contract.
Ammonia plant complex (5 plants); Capacity (each), 330,000 Mt per year; Known locations, (1) Lu-chou, (2) Manchuria. Technology: Kellogg.	United States: M. W. Kellogg	November 1973	1975–77	130.0	Cash, no financing involved. Terms: 20 percent down, 70 percent on completion, 10 percent on start-up. Delivery at 3-mo intervals to coincide with Kellogg urea plants negotiated in August 1973 (see above); 8 Kellogg plant contracts cover basic design, engineering, procurement, supervision of construction and commissioning. Plants are all for single-steam production base on so-called stripping process developed by Stamicarbon. These are the 1st contracts for complete process plants awarded a U.S. firm. Negotiations were conducted under license from U.S. Department of Commerce. Locations not yet known. Plants will be largest of kind in world.
Fertilizer complex: 3 ammonia plants; Capacity (each), 330,000 MT per year. 3 urea plants: Capacity (each), 574,200 MT per year. Technology, Topsoe/DSM.	France: Heurtey Industries; Netherlands: Dutch State Mines.	February 1974	1976 (start-up) to 1977.	118.0	Terms: 35 percent down payment; 65 percent payable over 5 yr at 6 percent p.a. Location: Nanking and Northeast China.
Catalyzer plant for hydrogen, ammonia, and methanol; Capacity, NA.	Denmark: Haldor Topsoe	February 1974			
Fertilizer complex: Capacity, NA	Japan: Mitsui Toatsu Toyo Engineering.	March 1974		42.0	

TABLE B-6.—OTHER PLANTS

Plant profile	Country and firm	Contract signed	Delivery period	Value (million U.S. Dollar)	Remarks
Pulp and paper plant: Capacity, NA; Location, Kwangchow.	United Kingdom Cellulose Development Corp., Ltd.	March 1963	1964	1.4	Terms: 10 percent down, most of outstanding balance to be paid at each shipment except for 5 percent payable upon completion of installation. Service agreement: Contract provided for supervision of construction work, but engineers were never permitted to visit. Agreement stipulated supply of replacement and spare parts.
Industrial alcohol plant: Capacity, NA	France, Melle & Speichem	January 1964		3.0	
Palm oil processing plant: Capacity, 14,800 MT per year.	Netherlands Stork-Werkspoor	May 1964		2.0	
Oxygen plant: Capacity, NA	Japan	September 1964		1.7	
Precision measuring instrument plant: Capacity, NA.	Japan	November 1964	1966	.8	
Foaming concrete plant: Capacity, 150,000 m³ per year.	Sweden International	December 1964		1.8	
Porous silica plant: Capacity, 150,000 m³ per year.	Sweden	December 1964		1.8	
Hydraulic equipment plant: Capacity, NA	Japan	March 1965	1966	1.8	
Oxygen plant: Capacity, NA	West Germany	August 1965		3.5	
Condenser plant: Capacity, 200,000 condensers per year.	Japan	September 1965		2.0	
Instrument plant: Capacity, NA	United Kingdom	1965		1.0	
Bank-note paper mill: Capacity, NA	France, ENSA (affiliate of Schneider & Arjonari).	1965		.424	
Straw cellulose plant: Capacity, 62.5 MT day	Finland	1965			
Bleached sulphur cellulose plant; Capacity, 80 MT day.	Finland	1965			
Zinc-refining plant: Capacity: NA	United Kingdom, Rio Tinto Zinc, Ltd.	1967			

Vacuum heat treatment furnace (2 units): Capacity, NA.	United Kingdom, Wild-Burfield (Pacher-Cowan Group).	1967		1.4	
Dynamite plant: Capacity, NA	Sweden, Nitrobel	September 1968			
Pulp plant: Capacity, NA	Finland	1968		4.2	
Oxygen plants (3 large): Capacity (each), 10,000 cum³ hour.	Japan, Kobe Steel Co.	June 1972		9.74	Should probably be included under iron and steel, but linkage not unequivocally established.
Integrated automated corrugated cardboard manufacturing plant: Capacity, 200 T day; 66,000 MT year.	Japan, Rengo Co.	August 1972		.324	Price includes royalty for knowhow.
Oxygen plants (2): Capacity, 440 T day; Location, Shanghai and Hsinkang.	France, L'Air Liquide SA	February 1973			May possibly be related to iron and steel production, but linkage not unequivocally established.
Oxygen (separation processing) plant; Capacity, NA.	West Germany, Linde AG	do		10.98	Same as for L'Air Liquide immediately above.
Motion picture procession plant; Capacity (initial): difference 100,000,000 ft of 35 mm. color release prints year (using Technicolor). Location: Peking.	United Kingdom, Technicolor, Ltd.	July 1973	1974	8.5	Terms: Cash, 50 percent down, 40 percent on delivery, 10 percent on acceptance. Plant to be designed in United Kingdom. For educational and industrial purposes. Training: Technicolor to train Chinese technical personnel.
Cement plant: Capacity, 1.2 MT year	France, Ciments LeFarge SA			4.5	Still under negotiation in January 1974.
Ballpoint pen plant: Capacity, 300,000,000 pens per year.	United States Chromalloy American Corporation (Alba, SA, a Swiss subsidiary, to design, construct, and operate plant).				
Ball and large roller bearing plant: Capacity, NA.	Japan: Nippon Seiko Co.; Koyo Seiko Co.	May 1974		103.0	1st contract of its kind with PRC. Japan exported some Y5 billion worth of bearing products to PRC in 1973, a 40-percent increase over 1972. With this new plant PRC should be able to meet entire domestic demand for bearings.
Freezing plant (plus large number of ice-making machines): Capacity, NA.	Norway: Finsam		Fall 1974–75		Purpose of plant will be to increase freezing capacity of Chinese fishing industry, facilitating transport of substantial proportion of catch to interior. Short term use: Additional freezing capacity for export of shellfish to Europe and Japan.
Plant for packaging bulk row sugar: Location, Whampoa.	Australia: Colonial Sugar Refining (CSR) Co. of Australia.	October 1974	April 1975		Bagging plant for bulk raw sugar located at Townsville, Queensland, is to be reerected at Whampoa so that cargoes of bulk sugar can be bagged after arrival.

CHINA'S ECONOMIC RELATIONS WITH THE THIRD WORLD

By Carol H. Fogarty

I. Summary

After the disruptions of the Cultural Revolution, the People's Republic of China reappeared on the international scene in 1970, with renewed determination to assert itself as a major world power. It sought to gain wider international acceptance by becoming a responsible spokesman for the Third World.[1] In assuming its new leadership role, China deemphasized its former activist policy of promoting radical change and upsetting established governments. Economic and military assistance and trade have thus risen in importance as instruments of policy toward the less developed countries (LDC's). At the same time that its own position in the LDC's was being strengthened, Peking sought to reduce Soviet and Western influence in the Third World.

In the past 5 years, 1970–74, China has boosted its economic aid commitments to the LDC's by $2.4 billion, more than double the $1.1 billion extended in the previous 14 years, 1956–69. Nearly two-thirds of the aid in the 1970's went to Africa. The single most important Chinese aid project is the almost completed Tan-Zam Railroad, into which Peking has poured an average of almost $100 million annually beginning in 1970.

The revitalization of China's relations with the LDC's has also found expression in stepped-up military aid. In the last 5 years, the People's Republic has furnished the developing countries a total of $300 million in military assistance compared with only $250 million previously. About three-fourths of Peking's military aid to LDC's has gone to Pakistan.

As for trade, the LDC's have become large markets for Chinese rice, iron and steel, and textiles, as well as important sources of supply for rubber, cotton, and nonferrous metals. In addition, the LDC's of East Asia are a major source of hard currency for the People's Republic. Chinese exports to the LDC's were about $1.4 billion in 1974, imports $900 million.

II. General Developments

In the 1960's China's credibility as a responsible power was severely taxed in the LDC's, first by its indiscriminate support of dissident elements in Africa and Asia and later by its inability to control events at home during the Cultural Revolution. The volume of China's economic aid to the LDC's declined precipitously after 1964, largely because of LDC's disenchantment with the program. African governments resented China's support for dissident groups, and two major Asian clients, Burma and Indonesia, broke relations with the PRC

[1] For purposes of this paper, the terms *Third World* and *Less Developed Countries* include the following: all countries of Africa except the Republic of South Africa; all countries of East Asia except Hong Kong and Japan; Malta in Europe; all countries in Latin America except Cuba; and all countries in the Near East and South Asia.

in the mid-1960's largely over the question of subversive activities. These setbacks to Peking's foreign policy objectives in the LDC's had not been digested when China's domestic, political, and economic structure was shaken by the Cultural Revolution. The People's Republic turned its attention inward, all but one of its ambassadors were withdrawn from their posts, and purges at the top of the government brought foreign policy initiatives to a standstill.

The upsurge in trade and aid in 1970 signaled China's break with radical ideological criteria for assistance to the Third World. In 1970 the PRC pledged more than $700 million of new economic aid to the LDC's, the largest annual aid commitment Peking had ever made. This commitment was almost 10 times Peking's average aid undertakings in any previous year and was equal in amount to two-thirds of all Chinese economic aid extended to the Third World during the previous 14 years of its aid program (see table 1). By the end of 1974, Chinese offers of economic aid to even the most obscure governments had become commonplace, as China's aid program maintained a brisk pace.

TABLE 1.—CHINA: DISTRIBUTION OF ECONOMIC CREDITS AND GRANTS COMMITTED TO LESS DEVELOPED COUNTRIES, BY AREA

[In millions of U.S. dollars]

	Total	Africa	East Asia	Europe	Latin America	Near East	South Asia
1956–74	3,465	1,878	306	45	133	374	729
1956–69	1,073	375	224			191	283
1970–74	2,392	1,503	82	45	133	183	446
1970	709	454				43	212
1971	505	325	57		44	45	34
1972	553	217		45	89	66	136
1973	428	335				29	64
1974	197	172	25				

Military assistance to the LDC's, always a secondary program to economic aid, also was affected by the new look. Military aid commitments in 1970–74 have exceeded the level of 1958–69.

III. The Economic Aid Program

Recent Directions

The past 5 years have witnessed a more than doubling of the amount of Chinese economic aid extended as well as a near doubling of the number of countries receiving aid. Since the beginning of 1970, Peking has pledged $2.4 billion of economic assistance to the Third World, bringing its total commitments since 1956 up to $3.5 billion.

During 1970–74, Chinese aid to the LDC's averaged about $480 million a year with the annual aid package fluctuating widely from the average. From its record $710 million committed in 1970, China's aid offerings declined to $505 million in 1971 and $555 million in 1972, then slid to $430 million in 1973 and $200 million in 1974. The drop between 1970 and the latest year does not suggest necessarily a change in China's aid policy; rather it may suggest a lack of opportunities, especially in Africa, for undertaking programs of the scale and kind China was able to initiate in the early 1970's. The spectacular level of aid commitments in 1970 stemmed from two key extensions; a $400 million pledge for building the Tan-Zam Railroad, China's largest aid project in the LDC's, and a $200 million credit for Pakistan. (See table 2.) In subsequent years, about one-half of the 50 separate aid allocations were for amounts ranging between $40 million and $100 million, and much of this aid is still in the pipeline to be drawn down.

TABLE 2.—CHINA: ECONOMIC CREDITS AND GRANTS COMMITTED TO LESS DEVELOPED COUNTRIES

[In millions of U.S. dollars]

	1956–69	1970	1971	1972	1973	1974	Total 1970–74	Total 1956–74
Total	1,073	709	505	553	428	197	2,392	3,465
Africa	375	454	325	217	335	172	1,503	1,878
Algeria	52		40				40	92
Burundi				20			20	20
Cameroon					71		71	71
Central African Republic	4							4
Chad					50		50	50
Congo	25							25
Dahomey				44			44	44
Ethiopia			84				84	84
Equatorial Guinea			NA				NA	NA
Ghana	42							42
Guinea	66	10				1	11	77
Kenya	18							18
Malagasy Republic				11			11	11
Mali	55				2		2	57
Mauritania	5		20		2	37	59	64
Mauritius				35			35	35
Niger					1	5	6	6
Rwanda				22			22	22
Senegal					49		49	49
Sierra Leone			30				30	30
Somalia	22		110			1	111	133
Sudan		42	40				82	82
Tanzania	54	201	1			75	277	331
Togo				45			45	45
Tunisia				40			40	40
Uganda	15							15
Upper Volta					50	2	52	52
Zambia	17	201			10	51	262	279
Zaire					100		100	100
East Asia	224		57			25	82	306
Burma	27		57				57	84
Cambodia	92							92
Indonesia	105							105
						25	25	25
Europe				45			45	45
Malta				45			45	45
Latin America			44	89			133	133
Chile			2	63			65	65
Guyana				26			26	26
Peru			42				42	42
Near East	191	43	45	66	29		183	374
Egypt	106				28		28	134
Iraq			45				45	45
North Yemen	57			21	1		22	79
South Yemen	12	43					43	55
Syria	16			45			45	61
South Asia	283	212	34	136	64		446	729
Afghanistan	28			45			45	73
Bangladesh	11							11
Nepal	62		2	35			37	99
Pakistan	141	200			50		250	391
Sri Lanka	41	12	32	56	14		114	155

The largest share of Chinese economic aid to the LDC's in the 1970's continued to go to Africa, which received almost two-thirds of the total. Among the African nations, Tanzania and Zambia were the largest recipients, accounting for more than one-third of the total extended to the continent. They ranked after Pakistan, as second and third among all Chinese aid clients. South Asia has received almost 20 percent of China's total aid package in the last 5 years, mostly because the PRC nearly doubled its commitments to Pakistan. The Near East, never an important claimant on China's aid resources, has received less than 10 percent of China's recent undertakings in the LDC's. A $45 million extension to Iraq in 1971 was the only commitment to a new recipient in the area. This assistance, together with additional pledges to old clients—Egypt, Syria, and the Yemens—accounted for all of the $185 million of new aid to the Near East in 1970–74. In 1971, China made its first overtures to Latin America and since then has signed aid agreements totaling almost $135 million. Chile, Guyana, and Peru have been the beneficiaries. Because of political changes in Chile that program is currently dormant while little has been done toward implementing aid to Peru and Guyana.

Almost half of China's economic aid commitments have actually been delivered. The People's Republic, which gets deeply involved in its foreign aid projects, has successfully coped with shortages of local funds and skills. These shortages have jeopardized the success of some foreign aid undertakings by other donor nations in developing countries. The Chinese usually retain control over projects at least until they are operational. They usually provide credits to cover the local cost component of aid projects, using the proceeds of sales of Chinese consumer goods and commodities on LDC markets. These funds are intended to cover the purchase of land, local building materials, equipment, and the payment of the salaries of local workers. China provides the administrators, skilled personnel, and usually large numbers of unskilled laborers as well. There were 23,000 Chinese technicians in the LDC's in 1974. In Africa, it is estimated that one Chinese technician is present for every $5,000–$6,000 of project aid expended.

Peking's record on its most ambitious project, the Tan-Zam Railroad, has been particularly impressive. This railroad will join the Zambian copper belt to the Tanzanian port of Dar es Salaam. Drawdowns averaged almost $100 million a year, and the line, begun in 1970, is nearing completion in early 1975, a year ahead of schedule. At the peak of construction, 16,000 Chinese workers were employed; where sales of consumer goods were not sufficient to cover local expenditures, China is thought to have provided hard currency.

Compared with other foreign aid programs during the past 5 years, the Chinese have had a good performance record. Earlier frictions—charges of subversion and inefficiency—have practically disappeared and the LDC's appear satisfied with the operation of the program. The Chinese have avoided some of the bottlenecks and delays that impede most aid programs by assuming a larger share of responsibility for implementation. China's success as an aid donor also is attributable to its understanding of the needs of developing nations, for, as its spokesmen hasten to explain, China, too, is a developing nation. Another factor in PRC success is the character of its projects—mostly light industrial, agricultural, and transportation. These labor-intensive projects often are easier to implement with sizable inputs of Chinese labor. The skills needed to operate the completed projects also are more consistent with the ability of the local labor force.

A Pragmatic Program

The sectoral distribution of China's aid among project-types has not varied much over time. Economic aid normally goes to economic sectors in which China performs well; these also are areas of development that are basic to most LDC plans. Peking continues to allocate the largest share of its aid resources to the development of infrastructure, primary industries, and agriculture. More than $1 billion of its aid (35 percent) has been designated for the construction of railroads, roads, bridges, and ports; another 23 percent for labor-intensive light industrial plants; and about 15 percent for agriculture and related multipurpose projects. Only 5 percent of China's aid has been allocated to heavy industry, all in Pakistan. (This contrasts with 65–70 percent of Soviet aid for heavy industrial projects.) The balance of PRC assistance has been channeled to urban development, to geological surveys, and to medical, tourist, sports, educational, and cultural facilities.

China's project assistance provides easily perceived development benefits in a short time. Profiting from its own postwar experiences, China has emphasized low-cost, easily operated projects. Projects often provide simple processing facilities for local raw materials. For example, light industrial projects—such as textile, plywood, paper, food processing, and agricultural implements plants—are constructed at low cost and are put into production rapidly. They draw on large local manpower and material resources. Usually minimal skills are required for their operation and maintenance. These plants often involve production of goods that the LDC's have heretofore imported in large amounts.

Commodities and cash transfers—often in the form of outright grants—are an important component of Chinese aid, accounting for possibly one-third of total Chinese aid deliveries. Commodities are used to generate currency to cover local project expenditures; China also has provided more than $400 million of commodities and hard currency as balance-of-payments support, not necessarily related to development projects.

In recent years, Peking has softened the already liberal terms of its aid to the Third World. The typical Chinese agreement of the sixties was interest-free and allowed repayment over 10 years after 10 years grace. Now, longer grace periods are allowed, ranging up to 20 or 30 years, and amortization periods often are longer than before. These terms make Chinese aid even more attractive, particularly to the poorer LDC's. Since the inception of its program, China has provided more than half a billion dollars of its aid in the form of grants. Grant aid recently has averaged about $40 million annually. In addition, China has provided the equivalent of about $1 billion of grant aid in the form of free technical services to development projects. China does not include the value of these services in estimates of its aid undertakings, and the figures in tables 1 and 2 do not take them into account.

Generous payment terms and rapid delivery of Chinese aid combine to make it an attractive form of assistance. High ratios of Chinese inputs of labor, cash, and commodities have helped keep projects moving. At present, China's annual gross aid outlays are not reduced significantly by reflows for debt servicing. This contrasts with other Communist aid programs under which some LDC's already are experiencing a zero net aid flow. No interest is collected on the LDC aid debt to China and only small payments on principal have begun. The People's Republic usually accepts repayment in goods rather than hard currency. In many cases this arrangement helps ease the LDC's repayment burden, especially where nontraditional exports, not easily sold in world markets, are used.

IV. The Military Aid Program

The revitalization of Chinese economic relations with LDC's in 1970 also was reflected in China's military assistance. During the 5 years beginning in 1970 China provided $300 million of military aid to developing countries, compared with only $250 million in the previous 12 years. Most of China's military aid is provided as outright grants, the bulk flowing to Pakistan and Tanzania. The addition of 10 new arms clients, mostly in Africa, since 1969, has brought the number of LDC's receiving Chinese military aid up to 18. In all cases, these new clients have previously received Chinese economic aid. Except for aid to Pakistan and Tanzania, recent agreements have involved small arms, ammunition, vehicles, and training—aid that does not call for a substantial Chinese military presence.

About three-fourths of all Chinese military aid has gone to Pakistan. For a long period after the 1965 India-Pakistan War, the People's Republic was the only country willing to supply Pakistan's military requirements. Chinese equipment, which accounts for about one-half of Pakistan's air and ground inventories, includes Mig jet fighters, IL–28 jet light bombers, light and medium tanks, and a variety of ground forces, communications, and support equipment.

Tanzania, the second largest arms client, accounts for about 10 per cent of China's military aid. It is the only non-Communist country that has become almost completely dependent on China for arms and training. Since 1964, the PRC has delivered approximately $60 million of Chinese equipment. China also has constructed naval and air facilities in Tanzania and trains Tanzanian military personnel.

The Chinese experience in military aid contrasts sharply with Soviet experience. Moscow has built up a large arms trade with the LDC's over the past 20 years and has signed military agreements totaling almost $12 billion. Moreover, in some cases the U.S.S.R. has succeeded in creating LDC dependence on its equipment and spare parts. Peking has not challenged Soviet arms supply dominance among Communist nations, even in Black Africa.

V. China-LDC Trade

An aggressive trade promotion program initiated by Peking in 1970 has broken the pattern of stagnation in China-LDC trade. By 1973, trade was more than double the 1970 level, with Chinese exports to the LDC's of $1.3 billion and imports of $800 million (see tables 3 and 4.) In 1974, preliminary estimates put exports at $1.4 billion and imports at $900 million.

The sharp increases of recent years reflect Peking's global initiatives in expanding markets for its goods and in supplementing domestically produced resources for its own development. Trade with the LDC's remains at roughly one-fifth of China's total trade.

TABLE 3.—CHINA: TRADE BY LDC AREA AND COUNTRY, 1973

[In millions of U.S. dollars]

Area and country	Turnover	Chinese exports	Chinese imports
Total	2,075	1,270	805
East Asia	825	660	165
Of which:			
Indonesia	155	150	5
Malaysia and Singapore	460	325	135
Near East and South Asia	450	260	190
Of which:			
Egypt	40	25	15
Pakistan	60	46	14
Sri Lanka	70	31	39
Latin America	300	45	255
Of which:			
Brazil	78	2	76
Chile	121	16	105
Peru	40	(1)	40
Africa	470	285	185
Of which:			
Nigeria	44	36	8
Sudan	101	35	66
Tanzania	104	89	15
Other	30	20	10

1 Negligible.

Source: The data used to estimate China's trade consist of official trade statistics published by China's trading partners. Most of these data are compiled by the U.S. Department of Commerce. Data have been adjusted to reflect Chinese imports c.i.f. and Chinese exports f.o.b.

TABLE 4.—CHINA: VALUE OF EXPORTS TO AND IMPORTS FROM LDC's, BY AREA

[In millions of U.S. dollars]

	1966		1970		1971		1972		1973	
	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import
Total	510	385	525	300	575	370	740	625	1,270	805
Africa	95	50	125	105	185	155	195	155	285	185
East Asia	210	80	210	60	225	50	330	90	660	165
Latin America	5	105	10	5	10	55	20	210	45	255
Near East and South Asia	200	150	180	130	155	110	180	170	260	190
Other							15		20	10

Source: U.S. Department of Commerce, "Value Series." Data are adjusted to reflect Chinese imports c.i.f. and Chinese exports f.o.b.

The increases in the value of China-LDC trade reflect not only greater physical volume, but also international inflation and the revaluation of currencies. Average prices in 1973 increased 25 per cent for copper and 35 per cent for cotton, and almost doubled for rubber compared with 1970; these three commodities make up almost 65 per cent of Chinese imports from the LDC's. These increases have been accompanied by rising prices for rice and (to a lesser extent) textiles, major Chinese exports to LDC's.

The surplus in China's LDC trade balance averaged $220 million during 1967–72. In 1973 it soared to $465 million in spite of large deficits in Chinese-Latin American trade. Preliminary estimates for 1974 indicate a surplus of $500 million. (Details on Chinese trade with individual LDC's in 1974 are fragmentary; the following discussion thus is tied to 1973.)

Chinese trade with all LDC areas increased in 1973, the most important gains coming in trade with East Asia and Latin America. The shares of Africa and the Near East in China-LDC trade have slipped in the past 4 years. East Asian countries accounted for 40 per cent of China-LDC trade in 1973, Latin America, which became a major raw materials supplier, accounted for about 15 per cent of total trade.

Trade with its East Asian neighbors traditionally has been the most profitable segment of Chinese trade with the Third World. Malaysia and Singapore, China's largest trading partners in the Third World accounted for $460 million (22 percent) of its total trade turnover with LDC's in 1973. This always has been a major account, one on which China has run its largest trade surplus—a hard currency surplus. Recent agreements with countries in East Asia include: Burma, after a hiatus of 3 years, is again importing commodities under credit following the resumption of relations in 1971; Malaysia has signed (1973) its first direct agreement with China to receive rice for rubber; Indonesia signed (1972) its first trade contract with China since their relations were severed in 1967; and Thailand (1973), and the Philippines (1974) have agreed to buy petroleum from China.

On the other hand, the expansion in China's trade with Latin America in 1973 was mostly on the import side. Large purchases of agricultural goods from Brazil and nonferrous metals from Chile offset a portion of the surpluses that accrued in China's accounts with Malaysia, Singapore, and Indonesia.

Foreign trade with the LDC's has important implications for China's domestic development. Third World countries have become large markets for Chinese products and an important source of hard currency. Among Chinese exports in 1973, 80 percent of the grain, 75 percent of the iron and steel, and 30 percent of the textiles went to LDC's. The developing countries also are suppliers of key raw materials. They provided 45 percent of China's crude materials purchases in 1973 which include all of China's rubber, half of its cotton imports, and 45 percent of its nonferrous metal imports. Agreements now in force with LDC suppliers assure the continued flow of cotton, copper, and rubber for domestic industrial operations. Agreements to buy grain and sugar from the LDC's will help to alleviate pressures of a growing population on domestic resources.

World shortages of primary products have alerted China to the increasing need for agreements to assure stable supplies of raw materials and foods. Moreover, because the People's Republic continues to run substantial deficits in its trade with the developed West—perhaps $2.5 billion in 1974—surpluses in its LDC trade are important for balancing its trade with the rest of the world.

Appendix

Note on Sources

Data on foreign aid contained in this paper are drawn from numerous official and nonofficial public documents. A primary source of information on China's aid to LDC's is the annual series on Communist aid programs published by the Bureau of Intelligence and Research of the U.S. Department of State. Trade statistics are from People's Republic of China: International Trade Handbook, a research aid published annually by the Office of Economic Research of the Central Intelligence Agency.

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