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AN ECONOMIC PROFILE OF
MAINLAND CHINA

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JOINT ECONOMIC COMMITTEE
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Volume 1:
General Economic Setting
The Economic Sectors



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LETTERS OF TRANSMITTAL

FEBRUARY 22, 1967.

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 Communist China entitled "An Economic Profile of Mainland China." 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 actual 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.

In the past years the committee through a similar collection of expert studies has contributed substantially to understanding of the strengths and weaknesses of the Soviet economy.

At the present time, China, the largest nation in the world, currently involved in a revolutionary turmoil, is both an enigma and a potential threat to world stability. Obviously it is a subject of primary concern, and we have an obvious and great 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 hoped, too, that it will serve as an aid and a stimulus to private scholars working on this subject. The committee is deeply indebted to the scholars 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.

At the same time, the committee received the wholehearted cooperation from numerous agencies of the Federal Government, also designated in the accompanying transmission letter. Likewise, six universities made it possible for their faculty members to make valuable contributions to the committee's efforts and I would like to extend the committee's sincere thanks to them. They, too, are listed in the accompanying letter.

Finally, we wish to take this opportunity to express our gratitude to the Legislative Reference Service for making available the services of Leon M. Herman, senior specialist in Soviet economics who helped to plan the scope of the research and coordinate 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 its individual members.

WILLIAM PROXMIRE,
Chairman, Joint Economic Committee.

FEBRUARY 20, 1967.

HON. WILLIAM PROXMIRE,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a volume of materials on the economy of Communist China entitled "An Economic Profile of Mainland China." 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 several Departments of the Federal Government and from a number of the major universities of the country. 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, rates of growth, capital formation, planning and management, the defense burden, mineral resources, agriculture, industry, population, employment, labor incentives, education and research, international trade, and foreign economic aid.

The Joint Economic Committee undertook the present study, you will recall, with a view to providing a body of basic information on the economy of Communist China that would be useful in helping to focus public discussion on one of the critical problems of our times, namely the correlation between the forces working toward stability and the forces tending toward upheaval within the most populous nation in the world today. 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 Mainland 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:

John S. Aird	William W. Hollister
Arthur G. Ashbrook	Edwin F. Jones
John Ashton	Milton Kovner
Loyal G. Bouchard	Marion R. Larsen
Chu-Yuan Cheng	Ta-Chung Liu
John Philip Emerson	Léo A. Orleans
Robert M. Field	Robert L. Price
Walter Galenson	S. C. Tsiang
J. G. Godaire	K. P. Wang
Charles Hoffmann	Yuan-Li Wu

In addition, the committee received the wholehearted cooperation from the following agencies of the executive branch of the Government:

Bureau of the Census	Central Intelligence Agency
Department of Agriculture	Library of Congress
Department of State	National Science Foundation
Department of the Interior	

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.

In addition to the individual contributors, the following six universities were most helpful in making it possible for faculty members to contribute to the study:

State University of New York
[Stony Brook]
Cornell University
Stanford University

University of Michigan
Queens College
University of Rochester
University of San Francisco

The Library of Congress made available the services of Leon M. Herman, senior specialist in Soviet economics, who helped to plan the scope of the research and to coordinate the contributions for the present study.

JOHN R. STARK,
Executive Director.

AN ECONOMIC PROFILE OF MAINLAND CHINA
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FOREWORD

The economic development of China, within a framework of Communist political institutions, has been underway over a period of less than 18 years. Within this historically brief span of years, however, the policies governing economic activity in the country have displayed a remarkable tendency to swing back and forth between authoritarian pragmatism and revolutionary utopianism. During the years when revolutionary fervor was under effective restraint, the economic agencies of the country succeeded in pursuing a roughly consistent investment program which resulted in substantial annual gains in production in industry as well as in agriculture. However, when the national leadership became impatient with the attainable pace of economic growth and began to search for some form of political magic that might produce spectacular economic achievements within a short span of time, the effect has tended to be disastrous.

I. OVERALL ECONOMIC GROWTH

The first phase of the enormous economic task facing the new regime in Peking, after it came to power in October 1949, was the rehabilitation of the national economy from the effects of the devastation of the Sino-Japanese war and the severe internal strife that came in the wake of that conflict. By all accounts, the work of rehabilitation was completed within a fairly short period of time. By 1952, the net domestic product of Mainland China was higher than it was in 1933 by a margin of some 20 percent. In per capita terms, however, the national product was only 6 percent higher.

The active promotion of economic growth by the Central Government began in earnest after 1952. During the following 5-year period the aggregate national product grew at a steady and fairly high rate. The best available estimates show that Communist China registered a growth rate of 6 percent during 1952-57, which is a respectable rate by international economic standards of the recent past.

Investment was maintained at a high level during the period. As much as 23.8 percent of the total national product was invested, which must be adjudged as a solid, if painful, achievement for a country with as low a per capita product as that of China.

High as it was, however, this rate of investment was not sufficient to absorb the rapidly growing population of working age. The total population was expanding faster (2.3 percent) than employment (1.5 percent). Per capita consumption, which is as good a standard measure of general economic well-being as any, was rising at a rather modest pace; namely, 1.9 percent. In this respect, the prewar 1933 level had not been regained by the end of 1957.

Given the brief span of time involved, the record of economic achievement during China's First Five-Year Plan appeared to be quite good in the opinion of most outside economic observers. But not, it

would seem, in the view of the political leaders of China. Their ambitions, domestic and international, coupled with their confidence in their ability to stimulate the revolutionary enthusiasm of the new elite, led them to adjudge the growth pattern of the 1952-57 period as unsatisfactory. They drew up, instead, a new and radically different program, which they hoped would, among other things, find more immediate use for the underemployed manpower of the nation without, at the same time, diverting scarce capital resources from any of the high-priority industrial projects of special interest to the leadership.

What followed was the Great Leap Forward. Levels of production were scheduled to increase in 1 year by 100 percent throughout the economy. In the villages, the Government organized "communes" as a way of absorbing the enormous amount of surplus rural labor without the use of either machinery or highly trained labor. Village life was thoroughly regimented, with the peasants being marched to the field to work extra-long hours. In the industrial communities, severe forms of pressure were brought to bear on the industrial enterprises to expand production at an unrealistic rate.

The economic Leap Forward, despite the enormous political effort behind it, produced only a modest margin of new growth, estimated at 13 percent, between 1957 and 1958: from 95.3 to 108 billion yuan. But it did succeed in laying the groundwork for serious disaster to come.

The neglect of labor incentives in the village, the abolition of the all-important private family plot, the practice of equalitarian distribution of income, the exhausting pace of production, and the general excessive regimentation of commune life and activity, played havoc with the level of farm output. Bad weather and unrealistic farming practices contributed further to the downward trend in agricultural production.

The whole economy suffered a serious leap backward. Farm production declined sharply between 1958 and 1960. The shortage of agricultural raw material, in turn, slowed down severely the activity of important elements of the industrial sector. The aggregate domestic product of 1961 (92.2 billion yuan) was 15 percent lower than in 1958 (108 billion). Per capita output dropped about 19 percent, approximately back to the 1955 level.

Faced by a widespread decline in levels of economic performance the Government was forced to relax the worst features of the Great Leap policy. The economy began to recover in 1962, in response to this change. By 1965, the total national product regained the 1958 level. What is important, however, is the fact that a total of 7 years were lost by the Chinese economy without any growth, while most of the countries around the globe registered a healthy measure of growth and development during the same span of years.

II. INDUSTRY

While the official data supplied by the Chinese authorities are both scant and ill defined, scholars working in this field have been able to develop a useful body of quantitative data on the performance of the all-important industrial sector. Their findings show that industrial production in China has grown rapidly since 1949. The average an-

nual rate of growth has been calculated by our experts in this study at 11 percent between 1949 and 1965. The peak year in this growth record was 1960 (88 percent above 1956). The experimental policies of the Great Leap forced industry to slide backwards during the succeeding 2 years. Since 1963, industry has been slowly climbing back to the 1960 level, but had covered only part of the way back by 1965 (48 percent above 1956).

At the same time, there has been extreme variation in growth performance from year to year and by branch of industry. All detailed information on the progress made by the individual branches of production comes to an end in 1959, for lack of underlying official data.

The outlook in industry for the Third Five-Year Plan period, due to end in 1970, is clouded by the present campaign of political agitation. This campaign is known to have made heavy demands upon the time and energies of managers and workers alike, who have to attend endless meetings and demonstrations in support of the thought of Mao Tse-tung.

Most observers, however, do not consider it likely that the leadership would attempt another Great Leap, if only because the memories of the results of the earlier experiment in revolutionary enthusiasm as an instrument of economic development is still fresh in the public mind. What is more to the point, another Great Leap at this stage could be even more disastrous: Food supplies are now in a more precarious position than they were in 1958, and the population is larger by some 100 million persons.

The experience of the Great Leap seems to have produced a strong sobering effect upon the country's policymakers, removing for some time to come the tendency to regard heavy industry as an end in itself. During the period 1961-66 that experience has induced the national leaders to follow what might be called a demand-oriented policy toward heavy industry. There is, as a result, a huge amount of excess capacity in heavy industry. This fact alone is assumed to be sufficient to dissuade the policymakers in China from resuming in the late sixties the kind of heavy industry push that was characteristic of the previous decade.

However, continued poor performance in the farm sector is likely to retard the growth of light industry. Given the precarious state of farm output, the emphasis is expected to be on food crops rather than fibers and other industrial crops. This means that the consumer goods branches of industry will probably not regain their previous peak levels by the end of the Third Five-Year Plan (1970). In heavy industry, the drain of the weapons program is also expected to have a negative effect on the growth capacity of the sector as a whole. Hence, industry as a whole can be expected to grow during the next few years at a rate of some 5 percent and thus regain the previous (1960) peak level of output by 1970. In other words, the misguided economic policies of the Leap Forward will have cost China a full decade of industrial growth.

III. AGRICULTURE

Mainland China contains within its borders nearly one-fourth of the population of the world but only 7.8 percent of the world's cultivated land. The volume of agricultural production is second only to that of

the United States, but the supply of arable land amounts to only 0.35 acres per person, as compared with 1.9 acres per person in this country.

Agriculture looms large in the national economic life of China. It provides a livelihood for 80 percent of the population and contributes a major share of the total national product. The farm sector is an important source of raw materials for a number of consumer goods industries as well as of the kind of export commodities that earn the bulk of the country's foreign exchange. For all that, however, the investment allocations going to agriculture, under the system of priorities in effect in Communist China, have been extremely limited relative to its enormous needs. Expansion of cultivated areas has proven to be both difficult and expensive. Much of the western two-thirds of the country is characterized by rugged terrain, and unfavorable soil and climate conditions. The more feasible approach appears to be to concentrate on a policy of increasing the yield of the existing acreage by means of modern, intensive, farming methods. This approach, too, can be pursued only with the aid of additional, expensive production input.

After the advent of the Communist regime in China, the peasant families began to be organized into "producer cooperatives," a variety of the Soviet type of collective farm. By 1957, the process of collectivization was completed, to the great ideological satisfaction of the Government. In the process, however, the peasant lost title to his land, along with his age-old hope for independence, and became a tenant for the state. The latter assumed full control over the collection and distribution of farm "surpluses," on the basis of Government-fixed prices, supplemented by a scheme of official incentive devices and centrally determined administrative procedures.

The effect of collectivization on the farm sector was uniformly unfavorable. Incentives declined, collective field crops were poorly tended and the mortality rate of commonly owned draught animals rose to new heights. There was, at one and the same time, a notable lack of good technicians and a surplus of politically loyal farm directors. The rate of increase of agricultural output began to slow down perceptibly. Still, through most of the 1950 decade there was a modest per capita increase in farm output.

The wave of new Government intervention, which came with the Great Leap, brought more administrative innovations and increased the pressure on the daily lives of the peasant families still further. Agriculture, industry, commerce, education (and the military) were organized into big "communes." The last vestiges of private farming (garden plots and livestock) vanished from the countryside.

The impact of the Great Leap on farming was disruptive in the extreme. The precarious balance between population and food supply took a turn for the worse. Limited food supplies became even more scarce; traditional foreign trade patterns were disrupted: severe rationing was imposed, and China became a net importer of food.

As soon as the disastrous effects of the Great Leap on agriculture became known Government policy was thrown into reverse gear. Concessions were made to the peasants, such as the return of the right to the private plot and the functioning of the free market. Under the new dispensation, the work team (20 to 30 families) became the basic operational unit in farming. As a result, a certain improvement in

agricultural production began to be evident since 1961. The fact remains, however, that the population of China today has not regained the level of food consumption it enjoyed in 1958. On the one hand, production on private plots has increased sharply since their revival in 1961. However, the results in the socialized farm sector, which has been the chief beneficiary of financial inputs by the Government, have been disappointing, and output in this sector continues to decline in per capita terms.

IV. POPULATION AND HEALTH SERVICES

At present, the official position of the Government of China on the question of fertility control is not completely clear. Since 1962, encouragement has, once more, been given to contraception, sterilization, and the postponement of marriage. Abortion has again been made available under liberal provisions, and the three-child family is being advocated and promoted as the ideal. In all, however, recent official statements seem to suggest that the issue is not regarded as very urgent. A falling birth rate would no doubt be welcome, but China's leaders do not seem to have attached a high priority to his objective in recent years.

One of the more stable elements of domestic policy has been the commitment of the Communist Government to general health improvement. Health services are popular with the people, and this fact is a matter of some consideration even within an authoritarian system. Furthermore, the health services help: (a) to cut current worktime losses due to illness; and (b) to extend the average working life of the individual and thus get a greater return on the investment in education and labor force training.

Health improvements beyond a certain point, however, tend to rise sharply in cost. The benefits of the latest medical and surgical advances are thus more likely in the near future to be provided to members of the political and technical elite rather than to the mass of the population. Hence, there is little likelihood of an immediate marked decline in mortality levels in Mainland China.

In view of the wide margin of uncertainty about the state of the food supply and related economic conditions in China in the near future, the experts find it quite impossible to come up with some firm figures about the prospective population of Mainland China. The natural increase, as they see it, is likely to fluctuate around a figure of 2 percent. But even under the most pessimistic assumptions, one of their estimates of China's population points to a figure beyond 1 billion by 1985. It may run as high as 1,298 million.

V. URBAN EMPLOYMENT

The urban economy, which has grown rapidly as a result of the proindustry policies of the Government, has not been able to provide employment for the growing urban labor force. This has been one of the most intractable problems confronting the regime. During the first 3 years following the establishment of Communist rule in 1949, nonagricultural employment grew at an average rate of 12 percent per year. This rate proved, however, to be too high to be sustained over a longer period of time.

The First Five-Year Plan proved to be especially ineffective on this score. During the years 1953-57, the growth rate in urban employment reached an average of only 1.5 percent per year. While some increases in employment resulted from the large investment made in the state sector of the economy, these were in part offset by losses in the declining private sector of the economy. Enterprises owned by private interests were either subjected to socialization or allowed to fall into a state of neglect during the years 1954-56.

A sharp upward spurt took place in 1958, when nonagricultural employment expanded by as much as 43 percent in the wake of the Great Leap Forward. Government policy had, quite clearly shifted in favor of a "revolutionary tempo" of economic development, calling for large inputs of unskilled labor. In the near collapse that followed, the policies and goals of the Second Five-Year Plan were abandoned. Such industrial growth as did take place after the retreat from the Great Leap has been limited for the most part to the petroleum industry, the production of agricultural machinery, chemical fertilizer, and the manufacture of weapons.

By 1964, nonagricultural employment was still 25 percent below the 1958 level, a clear indication that the urban economy had not recovered from the disastrous aftermath of the Great Leap. The momentum of industrial growth has been recovered but the forward pace has been notably slow during the 1960's.

VI. EDUCATION

The effort made by Communist China in the field of education has been well sustained throughout its 18-year history. Except for certain periods of political disruption, the educational system has functioned in fairly good working order and in general accord with the national goals established by the political leadership. Although unable to provide anything more than modest educational facilities for the hundreds of millions of young people in the country, the leadership has fostered a climate of prestige for education and, as a result, has succeeded in elevating moderately the educational level of its rural youth. It has, in addition, made the pursuit of literacy popular among the masses of its population.

More to the point, the Chinese Government has not overlooked the basic requirements of the economy for trained specialists in the fields most closely related to production. At the highest level, in the universities and colleges, the educational system has continued to provide the economy with specialists for the key professional fields, mainly engineers and scientists. At the same time, specialized secondary schools of the Soviet type have trained a large body of middle-level technicians, who work as support personnel for the specialists who are graduates of the institutions of higher education.

Education of the youth in China is generally combined with employment, a fact that is officially justified on ideological as well as economic grounds. The cost to the state, as a result, is reduced to a minimum by making local authorities responsible for the education of the youth under their respective jurisdictions.

The results attained by China in general education could have been even more impressive, of course, if the authorities had been content

to place less emphasis on political orthodoxy and ideological training. In this respect, official policy has been strongly ambivalent by encouraging high educational attainments on the part of individuals and, at the same time, continuing to treat with distrust persons who achieve a high level of competence, China has had, so to speak, one foot on the accelerator and the other on the brake throughout her short history under Communist rule. The leaders have been unable thus far to resolve the conflict between their two major goals in education; namely, the inculcation of needed skills and the political indoctrination of the younger generation.

There is some evidence, too, that educational expansion in China has been somewhat too rapid, especially in light of the attained rate of economic growth. In the first 6 years of the present decade, as many as 23 million persons have graduated from the secondary and higher levels of education. This plethora of newly trained personnel, however, happened to have coincided with a slowdown in the demand for urban and industrial manpower. The continuing inability of the economy to absorb these graduates into fields of employment that would utilize their skills is known to have produced a depressing effect on social morale.

VII. RESEARCH AND DEVELOPMENT

There has been, right along, a very strong awareness among China's national leaders of the close relationship between scientific research and economic growth. The kind of resources that are required for the maintenance of a research establishment, however, are uncommonly scarce in a country at the stage of development of present-day China. The political authorities have, therefore, tended to concentrate the available domestic talent for scientific and technical research in fields that are most likely to produce quick and spectacular results.

New technological developments in the more advanced countries of the West are followed closely in Mainland China and studied selectively for adaptation to domestic requirements and conditions whenever they can be of immediate practical use. This utilitarian approach has tended to underrate basic research, while emphasizing production-oriented research and development.

China does not publish any figures on either the size or the cost of its research establishment. Western observers have estimated that at present between 50,000 and 60,000 scientists and engineers are engaged in research and development (R. & D.), supported by some 160,000 semiprofessional technicians and assistants, and by about 200,000 other personnel. On this scale of operation, it is assumed that Communist China is now spending between 1.2 and 1.5 billion yuan on R. & D., or a little over 1 percent of the gross national product of the country.

VII. FOREIGN TRADE

All activities of the Government of China, including the exchange of goods with the outside world, are directed toward the overriding goal of transforming the vast domain under its control from a backward, agrarian nation into an industrial state, with a powerful military establishment and a commensurate influence in international affairs. In order to help attain this objective, foreign trade in China is organized as a monopoly operation of the state, along the model of the

Soviet Union. As such, foreign trade is oriented toward a range of activities that are designed to assure the importation of the kind of capital goods that embody the latest industrial technology available abroad. Another major function of foreign trade in China involves the compensation, via imports, of serious shortfalls in production and mistakes in economic planning. Beyond these purely economic functions, trade with the outside world is also pursued in a way calculated to promote Chinese influence abroad, primarily among the less-developed countries around the world and within the system of Communist states.

The course of events in external commerce has been as uneven in Communist China since 1949 as all other spheres of economic activity. During the first decade of the new regime, the expansion of foreign trade operations proceeded at a rapid tempo. Total value of trade rose from \$1.2 billion in 1950 to a peak of \$4.3 billion in 1959, and then declined to a level of \$2.7 billion in 1963. This strong downward trend was reversed in 1963, and by 1965 the value of annual trade had recovered to an estimated \$3.7 billion.

Even more striking has been the political realignment in China's foreign trade during the decade of the sixties. Communist countries accounted for as much as two-thirds of China's trade before 1960. Today, however, the relative shares are reversed, with the free world countries now accounting for 70 percent of China's total trade.

The commodity structure of China's foreign trade has also changed drastically in recent years. During the late fifties, the basic pattern of this trade was characterized by the exchange of Chinese agricultural and mineral products, along with an increasing volume of textiles, for machinery and raw materials of the type best suited for the expansion of the industrial base of the economy. This pattern was rudely disrupted in 1960. The collapse of the Great Leap, accompanied by the withdrawal of Soviet industrial technicians, reduced the machinery content in the volume of goods imported by China. The persistent need for imports of grain from the West helped to accelerate this shift away from industrial imports in the commodity composition of the country's foreign trade.

Imports of agricultural products and chemical fertilizers accounted for 47 percent of China's total imports in 1965. By comparison, the same two categories of goods represented only 4 percent of all imports in 1959. For the first time in recent years, food exports in 1965 drew roughly even in value with food imports. What China is doing at present, in effect, is exchanging high-value food products (rice, vegetables, processed foods, and meat products) for a cheaper food item like wheat from abroad.

As part of the same shift, imports of machinery and equipment amounted to only \$330 million in 1965, a far cry from a figure of nearly \$1 billion imported in 1959. Since 1962 China has been turning more and more to the West for the purchase of complete plants and other equipment for high-priority industrial installations.

IX. ECONOMIC RELATIONS WITH THE SOVIET UNION

Inasmuch as the U.S.S.R. was the first and most experienced Communist state, the Chinese leaders found it natural during the early phase of the new regime to turn to Moscow for its economic strategy

as well as for its organizational structure in production. In the mid-fifties, China's leaders were still urging the nations to "learn from our forerunner, the Soviet Union."

They borrowed from Russia, for example, the notion of a central planning mechanism which prescribes production targets and rates of growth for major products for periods of 1 and 5 years. They also adopted the Soviet principle that investment should receive top priority, in the economy after setting aside as "adequate" defense budget and a minimum allocation for the consumption needs of the population. They also accepted the implication of this priority status: whenever resources for investment fall below the target, the shortfall is to be made up by diversion from the sector producing consumer goods and services. They were similarly attracted to the Soviet concept that in the interest of a high growth rate industry should receive the lion's share of investment in the national economy and that heavy industry, in particular, should be stimulated to grow at a faster rate than light industry by means of an investment allotment that is several times as large.

One reason that helped to heighten the attraction of the Soviet economic model for China's leadership, during the early fifties, was the fact that the U.S.S.R. showed a willingness to provide substantive support to China in its drive toward industrialization and modernization at a rapid pace. The assumption underlying the Soviet economic aid program seemed, at that time, thoroughly acceptable to the leadership of both countries. Both agreed that the Soviet Union was transferring to China not merely a package of industrial plant and equipment but rather a tested method of economic development under authoritarian rule and an entire complex of invaluable experience in industrial expansion.

Over the years, since 1950, the Soviet Union undertook to transfer to China, in connection with her forthcoming three 5-year plans (1953-67), a package of 30 industrial plants worth a total of about \$3 billion. Along with this, went a wide assortment of the fruits of Soviet research and development and the technical know-how required to run an industrial economy. By 1967, under this program, China was to receive 300 plants, all of them in the basic branches of industrial production.

China did not, of course, receive these benefits as a gift. In return, she had to export to the U.S.S.R. special food products, textiles, and processed ores, chiefly tin, tungsten, and antimony.

On balance, as one of the contributors to this study sees it, "the economic benefits from the trade were wildly asymmetrical." In light of its development needs, China was the unmistakable beneficiary of this exchange of goods. As long as the option of trade with the U.S.S.R. was kept open, the cost of industrialization to China remained an outstanding bargain.

X. THE EFFECT OF THE WAR IN VIETNAM

In spite of the steep rise in military activity in Vietnam, after 1964 there is no evidence of strain on the basic economic resources of China. The kind of support that China has given to North Vietnam in this conflict has involved, chiefly, large quantities of small arms. Beyond that, to be sure, it was required to provide rail transport, presumably

on a regular payment basis, for Soviet shipments of military supplies, chiefly air defense equipment.

Another contribution by China to the war has taken the form of sizable numbers of engineering troops to assist in the building and repair of roads, bridges and rail lines in North Vietnam. On the whole, the effort made thus far in connection with the war has been low in cost, and has, by and large, drawn on the kind of resources in which China has a comparative advantage. If, however, China were called upon for additional forms of support, such as large supplies of sophisticated weapons, such an increased effort could not conceivably be made without endangering the already precarious balance in the economy between available resources and irreducible needs.

XI. PROSPECTS

The effects of the present internal political turmoil on the course of economic development in China are, of course, impossible to discern at the moment. Assuming, however, that the civil turbulence will subside within the near future, the economic prospects facing China still remain rather bleak. The food-population problem will continue to absorb the attention of the leadership for some time to come. If the countryside were allowed to remain free of ideological pressure, as it was during 1961-65, the outlook for steady, if modest, improvement in output would be quite favorable. A continuation of the present policy of modestly increasing inputs of fertilizer, equipment, and better farm techniques accompanied by a tolerant attitude toward the private plot, small-scale trade, and household handicraft production could provide a steady increase in output of up to 7 to 8 million tons of grain a year. Even under these optimal assumptions, the food supply would remain precarious and some imports of grain from the outside would have to be continued. In this context, a normal situation would still have to contend with the fact that during 1966-70 the food supply as well as population would increase at about a rate of 2 percent a year.

INTRODUCTION

**THE CURRENT STATE OF CHINESE
ECONOMIC STUDIES**

BY

WALTER GALENSON

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THE CURRENT STATE OF CHINESE ECONOMIC STUDIES

SUMMARY

The systematic study of the economy of Communist China is only now beginning to get underway in the United States. By now, it is true, a number of highly competent individual scholars have demonstrated, through their pioneering work, that interesting and meaningful results can indeed be obtained by the application of tested analytical tools to the observation of such economic data as are available on this vital subject to date. Nevertheless, these real personal achievements in serious scholarship do not alter the basic fact that the main agenda of sustained research in the field of Chinese economic studies still lies ahead, that we are still a long way from our goal of arriving at firm conclusions about the manner in which the Chinese economic mechanism is functioning, the rate of economic progress achieved, and the discernible trends for the immediate future.

The present introductory discussion will consider three general aspects of the problem of research on the Chinese economy:

1. The obstacles to systematic research on the subject.
2. The results achieved and the major gaps to be filled in this area of study.
3. The need for further inquiry and public discussion.

1. THE OBSTACLES TO STUDY

The overwhelming problem that faces all students of the contemporary Chinese economic scene is the blackout of economic statistics imposed by the Chinese authorities in 1960, and continued ever since. For over 6 years, scarcely a significant figure relating to the national economy, regional economies, sectors of the economy, or branches of industry has been published. There has been no public announcement of the magnitude of steel or coal production, of machinery output, of the size of harvests.¹ The routine information which we ordinarily find in annual statistical yearbooks and allied publications is completely unavailable for China on a current basis.

Some precedent for this policy of suppression can be found in the history of Soviet statistics. Until 1936, the Soviet Union published rather detailed economic data, but from that year until the mid-1950's, there was a drought. However, the blackout was never as severe as in the case of China. Technical journals, such as those for the steel, coal, engineering, oil, textile, and other industries contained a good deal of quantitative material that could be utilized

¹The closest one gets to pronouncements on agriculture are such statements as the following: (a) About 1.3 million hectares of irrigated acreage were added during 1965 (*People's Daily*, Sept. 30, 1965); or (b) In 1964-65, farm subsidiaries contributed one-third of the gross value of agriculture and subsidiary products (*People's Daily*, Feb. 12, 1966).

effectively for research purposes. The long gap in macroeconomic data was partially bridged by the fortuitous acquisition of the detailed planning figures for 1941. There were also quarterly reports, on progress, couched, it is true, in percentage terms with no given base, but nonetheless permitting interested scholars to make informed (and sometimes amazingly accurate) guesses about contemporary events.

The Chinese have gone far beyond the Russians, and, indeed beyond any major nation in modern times. Most books, journals, and newspapers have been embargoed, so effectively that they are not even available in Hong Kong. Those few that still come through contain almost no economic data. There is an occasional statement about the success of an individual enterprise in raising its output, and a few percentage increase claims have been released (for example, that in the first 8 months of 1966, steel output was 20 percent higher than in the corresponding period of 1965). Visitors have been given an odd figure or two.² But there is nothing of a systematic character; not even plan targets. Indeed, we do not know whether China is actually operating under a 5-year plan.

This policy of statistical suppression was not followed during the first decade of Communist rule, when the quality of the available data was undoubtedly much worse than it is now. A substantial quantity of statistics was published up to 1958, culminating in the issuance of a retrospective statistical handbook in 1959, entitled *Ten Great Years*. While this was a slender volume compared with the *Statistical Abstract of the United States* or the Soviet *Narodnoye Khozyaistvo*, it is absolutely fundamental to any study of the period. The flow of material began to dry up in 1959, slowed to a tiny trickle in 1960, and then stopped.³

The quality of the data is another matter. First, as to outright falsification, I would subscribe to the following statement:

Deliberate falsification by central statistical authorities of underlying raw data is largely ruled out on grounds that it would serve little purpose and would be easily discovered by those whom the regime most wanted to fool, the Chinese people. Falsification of aggregate data would be somewhat easier but would also be of limited usefulness over the long run. In addition, except for 1958 and 1959, various types of aggregate data published by the regime usually possess a high degree of internal consistency.⁴

How reliable the published material is constitutes a much more complex problem. Prior to 1952, Communist China did not have a central statistical system, so that the data gathered by various national

² For example, a Canadian journalist who visited a number of enterprises in Manchuria was given only one approximate output figure, for an antiquated ball bearing plant in Harbin. The *New York Times*, Oct. 23, 1965, p. 45. A Dutch journalist who was permitted to travel extensively reported of his visit to the Nanking automobile plant: "How many trucks do they turn out? No one will tell you that; '30 percent more last year than the year before' is the best answer one can get." Hans Koningsberger, *Love and Hate in China*, New York, 1966, p. 67.

³ There is soon to be published the most complete compendium of Chinese statistics for the 1950's: Nai-Ruenn Chen, *Chinese Economic Statistics: A Handbook for Mainland China*, Chicago, 1967.

⁴ Dwight H. Perkins, *Market Control and Planning in Communist China*, Cambridge, 1966, p. 6276.

and provincial authorities were subject to little control. Establishment of the State Statistical Bureau in 1952 ushered in a gradual improvement in the gathering and processing of data and in the refinement of concepts.⁵

Some of those who have worked with Chinese data believes that the high point in statistical reliability was reached during the years 1955-57. Professor Eckstein has stated:

By 1955 the building of statistical institutions was essentially completed, so the territorial and accounting scope of the data remained fairly stable between 1955 and 1957. The best Chinese Communist statistics, thus, are those for these 3 years.⁶

However, this view is by no means unanimous. Professor Liu has indicated his position in the following terms:

One might hurriedly conclude that as a consequence of the Communists' efforts to improve their statistical reporting systems, their data for the later years, say 1955-57, are better than those for 1952-54. Their conclusion is unwarranted for it is precisely during these later years that the First Five-Year Plan was formally put into effect and that there were increased pressures on the managers of enterprises and local party members to fulfill or overfill the assigned quotas.⁷

It is his belief that since the data for 1952-54 were revised on the basis of *ex post* surveys, there is a case for according them greater credence than the data for 1955-57.

While this issue has not been resolved, there is no disagreement on what happened after 1957. Economic decentralization and the inauguration of the Great Leap Forward wreaked havoc with the statistical system. Reality gave way to wishful thinking at all echelons of the economy. A good example is provided by the agricultural statistics for 1958: The output of grain was announced initially at 375 million tons, presumably on the basis of crop reports from around the country. This was later scaled down to 250 million tons, a reduction of one-third, and there is considerable doubt about the validity of the lower figure. Exaggeration extended to all sectors of the economy. The claimed *increment* in coal output for 1958 was greater than total coal output in 1957. The volume of railroad freight traffic was reported to have doubled during 1958 and 1959. Pig iron production was supposed to have risen from 5.9 million tons in 1957 to 20.5 million tons in 1959. It is abundantly clear that official data for 1958, 1959, and 1960 (there are relatively few data for the last year) cannot be used without extremely close scrutiny.

The Chinese authorities have not hesitated to distort the meaning of data when it suited their purposes. For example, it was alleged that living standards rose from 1950 to 1955, and as proof, a large reported increase in the retail sales volume of state operated shops

⁵ Choh-Ming Li, *The Statistical System of Communist China*, Berkeley, 1962, ch. VI.

⁶ Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade*, New York, 1966, p. 276.

⁷ Ta-Chung Liu and Kung-Chia Yeh, *The Economy of Chinese Mainland*, Princeton 1965, p. 42.

was cited. In fact, the increased volume was largely due to the socialization of trade, resulting in the transfer of sales from private to state stores.⁸ For the years prior to 1958, however, a careful reading of footnotes and some knowledge of the basic concepts employed by the Chinese should enable users of data to avoid traps of this kind.

This raises the question of the usefulness of reported Chinese data for comparative economic studies. International comparison has been greatly facilitated by the work of the United Nations and its affiliated organizations, which have done yeoman service in the cause of uniformity of data among countries. These efforts have not yet reached Communist China, so that one is under the necessity of making careful adjustments to obtain minimal international comparability. The statistical isolation of China is thus in itself a formidable obstacle to analysis of its economy, and this is likely to persist even if China begins once again to publish economic data.

The impossibility of personal contact with Chinese economists employed in Government offices, research institutes, and industrial enterprises is still another difficulty that the student of Chinese affairs must surmount. Statistics are essential, but they are far from telling the whole story. During the Stalin era in the Soviet Union, Western work on that country lacked the richness and realism that has characterized more recent studies. Second-hand travelers' reports are no substitute for seeing things with one's own eyes.

American economists are barred from the Mainland, and apart from the possible value of contact with refugees, they are just as well off working at home as in Hong Kong or other areas contiguous to China. The few non-Communist economists who have been allowed to visit China have come back with little but fleeting impressions. The number of foreign businessmen visiting China is on the increase, and they are probably the best available source of information on technology there. But their experience is usually quite limited, and does not often permit generalization.

The same is true of those who manage to leave China with or without permission of the regime. There is a difference of opinion on the value of the testimony of refugees and emigrants. At best, they are hardly a random sample of the population and their knowledge of anything beyond their immediate environment is usually quite limited. To some extent the provision of refugee information has become professionalized, with some tendency on the part of interviewees to say what they think their auditors want to hear. These people will obviously continue to be a source of information as long as Peking maintains its present policy of isolation, but interview material must be regarded with great caution.

Another very formidable barrier to the study of China is language. While a great deal of current information is available in translation, there is simply no substitute for the ability to read original sources. A paragraph, or even a sentence, in a specialized journal or a secondary newspaper may contain the key to a problem. A research assistant can be very helpful, but he can never be an adequate substitute for personal study of original material.

⁸ Dwight Perkins, *op. cit.*, p. 219.

For the purposes of the economic analyst, Russian or the languages of Eastern Europe can be mastered in a relatively short time. Chinese is another story. People have different experience with learning it, but even after several years of intensive study, the degree of facility attained is generally not great. Many non-Chinese specialists with years of experience are still forced to lean heavily on Chinese research assistants.

This language problem greatly hampers the flow of qualified manpower into the field of Chinese economic studies. A graduate student in economics who intends to become a specialist on China will usually have to delay the completion of his studies for several years beyond the normal term in order to acquire sufficient Chinese to write a dissertation. Despite the fact that a number of universities have established special programs to train Chinese experts, with relatively liberal financing, only a handful of economists with specialties in this area have emerged during the past decade. The situation would be desperate were it not for a continuing flow of Chinese from Taiwan, who come to American universities for advanced degrees and stay on in teaching and research capacities. Apart from the fact that Taiwan cannot afford a drain of skilled manpower, this solution is far from ideal.

One further educational problem may be cited: in order to qualify as a specialist on Communist China, some degree of immersion in the history and culture of China is essential. Many of us used to argue that a good knowledge of economic theory and statistics, plus an introduction to the institutions of communism, were sufficient background. There may have been some warrant for this view in the fact that during the first decade of their regime, the Chinese Communists were following the Soviet development model quite closely, and adopted many Soviet practices. The Great Leap Forward and its aftermath, plus the break with the Soviet Union, dispelled all illusions about the uniformity of world communism. It became clear that the Chinese style was unique, and that Chinese Communist policy had to be read in the context of the cultural milieu. Let me hasten to add that this does not constitute advocacy for turning students into "old China hands" who seek to explain all current developments in terms of historical parallels. It is all too easy, when confronted with the difficulty of understanding contemporary events, to slip backward into the maze of history. But it does mean that specialists on Chinese communism, in addition to a thorough grounding in technical economics and the Chinese language, must be subjected to a fairly stiff dose of Chinese history and culture, which further lengthens the educational process.

2. THE CURRENT STATE OF CHINESE ECONOMIC STUDIES

In the face of the very formidable obstacles to analysis of the Chinese economy, a considerable amount of work has actually been done, attesting to the importance of the subject and the persistence of scholars. It is not my purpose, in discussing what has been accomplished, to provide a complete listing or to attempt an evaluation of the publications that are available in English. Aside from the fact that this

would be highly presumptuous, in a field so new as Chinese economic studies, where experimentation is very much in order, differences of opinion as to the quality and relevance of particular pieces of work are bound to arise. One is often struck with the great diversity of views on the studies that have been published, as evidenced by reviews in economic journals; a book may be hailed as a monument to scholarship by one reviewer and dismissed as unscientific and biased by another.

What I propose to do is to break the field down into subdivisions and to indicate the degree to which each has been worked over or neglected. The listing of items is intended to be purely illustrative rather than comprehensive.

A. NATIONAL PRODUCT AND INCOME

National accounts are no better than the underlying sectoral data employed in their construction. Before it is possible to claim that aggregates portray the performance of an economy adequately, the component series must have a fair degree of reliability. From what has already been said, it is clear that national product and income estimates for Communist China must be viewed with great caution.

However, even at an early stage of the game, it is useful to begin the construction of national accounts if only to provide a framework for the systematic marshaling of data and discovery of gaps in our knowledge. There were two early essays of this nature: one by William W. Hollister,⁹ covering the period 1950-57, and one by Alexander Eckstein,¹⁰ for the year 1952. The most recent and by far the most comprehensive study is that by Ta-Chung Liu and Kung-Chia Yeh,¹¹ for selected years between 1933 and 1959. While there are many conjectural elements in this volume it summarizes better than any other existing work the state of our knowledge of Chinese economic development. It is mandatory reading for anyone seriously interested in the Chinese economy.

Note should also be taken of the work of an outstanding Japanese student of China, Shigeru Ishikawa.¹² He has carefully examined Chinese national accounting concepts and his book provides useful information about Chinese methodology.

B. POPULATION AND LABOR FORCE

For the major recent works in this area, we are indebted primarily to members of the staff of the U.S. Bureau of the Census. John S. Aird has subjected the 1953 Chinese census of population to searching analysis and reached positive conclusions about its value for demographic work.¹³ He has also constructed a number of alternative population projections which, for the time being, are the best we have.

⁹ William W. Hollister, *China's Gross National Product and Social Accounts, 1950-1957*, Glencoe, Ill., 1958.

¹⁰ Alexander Eckstein, *The National Income of Communist China*, Glencoe, Ill., 1961.

¹¹ Ta-Chung Liu and Kung-Chia Yeh, *The Economy of The Chinese Mainland: National Income and Economic Development, 1933-1959*, Princeton, 1966.

¹² Shigeru Ishikawa, *National Income and Capital Formation in Mainland China*, Tokyo, 1965.

¹³ John S. Aird, *Population Growth in Mainland China* (mimeographed), Committee on the Economy of China, 1966.

John P. Emerson has performed a similar service for non-agricultural employment, by sifting every bit of evidence from Chinese and non-Chinese sources and coming up with estimates of employment by broad sector of the nonagricultural economy and for individual manufacturing industries.¹⁴ It is difficult to see what more could be done in this area at the present time for the years covered, though we urgently need employment estimates for years subsequent to 1958. More specialized manpower studies are represented by that of Leo A. Orleans on professional education and training,¹⁵ and by a volume dealing with scientific and engineering personnel, written by Chu-Yuan Cheng.¹⁶

A major lack in manpower studies is on the agriculture side. China is basically an agrarian country, and the large majority of its people live and work on farms. Available estimates of agricultural employment are exceedingly crude. The question of agricultural underemployment, difficult to tackle even where statistics are available, remains largely unexplored. That the Chinese authorities believed underemployment to be endemic is evidenced by their profligate use of manpower during the Great Leap Forward. That they overestimated the potential of this source does not alter the fact that there must be large numbers of farm people with very low productivity.

Clearly, much remains to be done in the analysis of Chinese population and manpower data, which are essential to the construction of national income accounts and to any assessment of an economy's performance. It is no reflection on the work of Aird, Emerson, and others to say that this remains a priority field of study.

C. AGRICULTURE

Despite industrialization efforts, this sector remains the major source of Chinese income. In part because of data problems and in part because of the vast contours of the Chinese agricultural scene, there has been a decided tendency on the part of Western scholars to shy away from the area. It is probably the single subject in Chinese economic studies which is most in need of further work.

What has been done thus far is mainly on the institutional and structural side. Kenneth R. Walker, a British economist, has published a small volume on the significance of the privately owned plot,¹⁷ and another more general paper on the much-publicized organizational transformations that have occurred.¹⁸ Anthony Tang has analyzed input-output relationships on a highly aggregate basis and made some interesting comparisons with the experience at other nations.¹⁹ A group of scholars, including John L. Buck, the author of the famous prewar study of Chinese agriculture, has recently produced a useful survey of the postwar agricultural scene, but again at a fairly aggre-

¹⁴ John P. Emerson, *Nonagricultural Employment in Mainland China: 1949-58*, Bureau of the Census, 1965.

¹⁵ Leo A. Orleans, *Professional Manpower and Education in Communist China*, National Science Foundation, 1960.

¹⁶ Chu-Yuan Cheng, *Scientific and Engineering Manpower in Communist China, 1949-1963*, National Science Foundation, 1965.

¹⁷ Kenneth R. Walker, *Planning in Chinese Agriculture*, London, 1965.

¹⁸ Kenneth R. Walker, *Organization for Agricultural Production in China* (mimeographed), Committee on the Economy of China, 1966.

¹⁹ Anthony Tang, *Policy and Performance in Agriculture* (mimeographed), Committee on the Economy of China, 1966.

gate level.²⁰ What still remains undone is a detailed analysis, similar to that of Dr. Buck's classic prewar study, in which individual crops and regions are examined to determine whether in fact the Communists have made any substantial advances as compared with the situation that prevailed before they took over.

There are several relevant studies currently underway, but it will be some time yet before results can be expected. The only feasible approach is through intensive analysis of the provincial and local newspapers that reached the United States prior to the Chinese imposition of the embargo on export of information. The work is tedious and the output of knowledge small compared with inputs of time and money. But as in the case of population and manpower, it is basic to our understanding of what is going on in Mainland China.

D. INDUSTRY AND HANDICRAFTS

The situation for the industrial sector is somewhat better than for agriculture. The fact that industry is much smaller in extent and that, relatively speaking, both statistical and technological data are available (at least up to the Great Leap) make the subject inherently more tractable.

Kang Chao has computed an index of industry output²¹ that is reminiscent of some of the early indexes of Soviet industrial production, notably that of Donald Hodgman. The merits of this work as well as its limitations have been pointed out in a review by K. C. Yeh, who also summarizes what remains to be done.²²

Detailed industry studies are essential supplements to aggregate analysis. The only one thus far published, by Yuan-li Wu, covers coal mining and electric power.²³ Studies of the steel, machinery, and chemical fertilizer industries are underway. The textile industry is an obvious candidate for monographic treatment, particularly since it offers the possibility of historical comparison with what was pre-Communist China's most important modern industry.

The handicrafts, which continue to play a highly important role in the Chinese economy,²⁴ have scarcely been studied in any systematic manner.²⁵ It is not difficult to understand why: the sector embraces a multitude of small units engaged in the production of a great variety of products, many of them consumed locally and not entering commercial channels. It is quite possible that the handicrafts have attained increased importance since the fiasco of the Great Leap Forward. The problems involved in analysis of this sector are somewhat similar to those for agriculture. Unfortunately, to the best of my knowledge, no one is currently engaged in a detailed study of the handicraft industries.

²⁰ John L. Buck, Owen L. Dawson and Yuan-li Wu, *Food and Agriculture in Communist China*, New York, 1966.

²¹ Kang Chao, *The Rate and Pattern of Industrial Growth in Communist China*, Ann Arbor, 1965.

²² *American Economic Review*, June, 1966, p. 571.

²³ Yuan-li Wu, *Economic Development and the Use of Energy Resources in Communist China*, New York, 1963.

²⁴ A recent Chinese statement illustrates this: In January 1966, there were said to be 25,000 handicraft workshops and producer cooperatives with a labor force of over 810,000 persons specializing in the production of farm implements. *People's Daily*, Jan. 4, 1966, p. 5.

²⁵ See, however, the article by Peter Schran in Choh-Ming Li (ed.), *Industrial Development in Communist China*, New York, 1964.

The construction industry is the subject of a forthcoming study by Kang Chao. The publication of this work will greatly advance our knowledge of an industry critical both to the growth of investment and to the improvement of living standards.

E. TRADE AND COMMERCE

The major work in this area is a book by Dwight H. Perkins dealing with price policy and the use of the market mechanism in the more highly organized sectors of the economy.²⁶ There is room for considerable additional research, however. We should know more, *inter alia*, about the wholesale and retail distribution network; about the function of prices, both in theory and practice; about rationing of goods; about rural distribution and the incentive effects of the manufactured goods made available to the countryside.

Foreign trade is a welcome exception in this catalog of things remaining to be done. Availability of statistical data from China's trading partners has permitted the preparation of two solid monographs: one by Alexander Eckstein,²⁷ and a second (to be published in 1967) by Feng-hwa Mah.²⁸ For the time being, this is one of the less rewarding areas of study in terms of additional knowledge that might be garnered.

F. PRICES, MONEY, AND BANKING

This remains, by and large, an unexplored field. There is a monograph on taxation and the state budget by George N. Ecklund,²⁹ but nothing substantial on the monetary system, on banking, and on changes in the level and structure of prices. Insofar as these subjects can be approached from the institutional side, they appear to be quite feasible. For years prior to 1958 sufficient data are available for analytical purposes.

G. WAGES, LIVING STANDARDS, LABOR INCENTIVES

Two studies in this general area may be cited: one by Peter Schran on income distribution,³⁰ and another by Charles Hoffman on labor incentives.³¹ But little has been done on a number of subjects eminently worthy of attention: standards of living, the wage system, the organization of the labor market, social services, and conditions of labor.

H. PLANNING, INVESTMENT, MANAGEMENT

Investment has been studied by K. C. Yeh, who has made estimates of both the level and structure of this key variable.³² It is too much

²⁶ Dwight H. Perkins, *Market Control and Planning in Communist China*, Cambridge, 1966.

²⁷ Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade*, New York, 1966.

²⁸ An abbreviated version of this forthcoming work is available in mimeographed form: Feng-hwa Mah, *The Foreign Trade of Communist China*, Committee on the Economy of China, 1966.

²⁹ George N. Ecklund, *Financing the Chinese Government Budget*, Chicago, 1966.

³⁰ Peter Schran, *The Structure of Income in Communist China*, unpublished dissertation, University of California, 1961.

³¹ Charles Hoffman, "Work Incentive Policy in Communist China," in Choh-Ming Li (ed.), *Industrial Development in Communist China*, New York, 1964.

³² K. C. Yeh, *Capital Investment in Mainland China*, (mimeographed), Committee on the Economy of China, 1966.

to say that further work on this subject is not in order, but the meticulous character of Dr. Yeh's work probably precludes any novel findings based upon presently available data.

Dwight H. Perkins has produced a lengthy paper on industrial planning and management.³³ However, detailed analyses of the planning mechanism, as well as of enterprise management, remain to be done. One would like to see for Communist China studies similar to those by Berliner and Granick for the Soviet Union.

3. THE NEED FOR FURTHER RESEARCH AND DISCUSSION

This brief résumé of the present state of Chinese economic studies underlines the magnitude of the task ahead. A comparable stage in Soviet economic studies was reached at least 15 years ago. Given the greater difficulties in the way of research on China, it is not likely that this field will achieve the same momentum as Soviet studies. This means that the marginal productivity of work on the Mainland economy will remain high for some years to come.

The dearth of serious analysis does not mean that there is no interesting and useful discussion of the Chinese economy. On the contrary, there is constant speculation in the press, much of it emanating from Hong Kong, on the current economic situation in China. The difficulty is that the various estimates one reads about—10 million tons of steel, 175 million tons of grain, 240 million tons of coal, and so on—have little solid basis in fact.³⁴ It is essential that those who are engaged in serious study of China make clear the extent of our ignorance as well as of our knowledge.

Speculation, however well or ill founded, will continue since urgent questions of public policy hang in the balance. For example, a crucial question is whether the Chinese are going to be able to overcome the food deficits which have led them to devote so large a proportion of their foreign exchange to the import of grain. The foreign policy stance of China may be critically affected by the ability of the Communist regime to provide its people with an adequate living standard through internal resources. The rate of industrial investment and growth will depend in considerable measure on the feasibility of machinery imports. Cessation of food imports may signal greater success in domestic agriculture, a tightening of belts, a better system of distribution, or some combination of the three. It is important to know which it is.

U.S. trade policy vis-a-vis China is another issue that should be based upon a knowledge of the facts. Our present policy was founded at least in part on the premise that by refusing to countenance trade with China, we are imposing obstacles to economic growth which will eventually force the Communist government to modify its foreign policy. Do the facts justify the premise, particularly in view of the

³³ Dwight H. Perkins, *Industrial Planning and Management* (mimeographed), Committee on the Economy of China, 1966.

³⁴ Typical is a recent dispatch from Hong Kong to the *New York Times*, Oct. 19, 1966, p. 8, which quotes "agricultural experts" and "authoritative analysts" on the expected grain production for 1966. How these estimates were made is not revealed in any way, nor is there any discussion of possible margins of error. Yet these and similar claims become imbedded in the public consciousness as facts when in reality they are extremely rough estimates which may have little relation to fact.

present state of Sino-Soviet economic relationships? Or are the Chinese getting the maximum of what they can afford from other Western nations?

What can be said about Chinese ability to operate as an international force and to influence the uncommitted nations? The image of the Chinese development model, so attractive a decade ago, has been badly tarnished by the failure of the Great Leap Forward. Are future developments likely to increase the attractiveness of China to developing nations, or further to disillusion them about that particular road to progress?

A good deal of impatience with the seemingly slow pace of Indian economic development is often expressed in the United States. But, in fact, have the Indians performed any less well than the Chinese in the years that have elapsed since the two countries embarked on central planning? It may turn out on closer examination that without the fanfare of breakneck industrialization, Great Leaps, Red Guards, and the like, the Indians have done at least as well as the Chinese, at a smaller cost to the people. This is not an assertion, but a question. If it turns out to be true, our current views on appropriate economic relations with India might well be altered.

This catalog of policy issues which depend for rational solution on a solid knowledge of the conduct of the Chinese economy could be lengthened, but it is hardly necessary to justify the allocation of substantial resources to the pursuit of such knowledge. Above all else is the fact that China, with a population somewhere between 750 and 800 million (and here I plead guilty to the common sin of citing figures which are difficult to defend), is likely to continue to be the problem nation of the world, the country which will offer the greatest challenge to the architects of American foreign policy in the years immediately ahead. An informed public opinion in the United States requires more than daily headlines about power struggles in Peking. Our communications media, some of which have made serious efforts to get at the basic facts, find themselves constantly frustrated by the lack of hard information.

Scholars are reticent to speak out unless they are absolutely certain of their facts. This is normally a good rule, but for those who are seriously concerned with China, its relaxation may be in order for the present. The boundaries of our current knowledge should be made clear, lest mere speculation be taken for proven reality. But if speculation there must be—and the present intense curiosity about China guarantees that it must—there is a case for urging those who are best informed to participate in the public discussion notwithstanding the many doubts that they may have about the validity of their present conclusions.

Part I. GENERAL ECONOMIC SETTING

**MAIN LINES OF CHINESE COMMUNIST
ECONOMIC POLICY**

BY

ARTHUR G. ASHBROOK, Jr.

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MAIN LINES OF CHINESE COMMUNIST ECONOMIC POLICY

INTRODUCTION

Since the establishment of Communist control over Mainland China in 1949, Mao Tse-tung and his lieutenants have tried to catapult China into the company of modern industrial nations. The ultimate objective of Mao's economic policy is political and military power. If, as Mao says, all power grows out of the barrel of a gun, there must be an arsenal to furnish the gun. Industrialization for Communist China, therefore, has meant first the building up of basic heavy industry—steel, coal, electric power, and petroleum refining—and then the building up of machinery and armament production. The culmination of this effort to date has been the three nuclear explosions in the Western desert.

This paper traces the main lines of Chinese Communist economic policy through the period of Rehabilitation (1949–52), in which the victorious Communists under Mao Tse-tung brought economic law and order to the war-torn Mainland; the period of the First Five-Year Plan (1953–57), which was marked by large-scale Soviet assistance in the construction and operation of dozens of modern industrial plants; the disastrous Great Leap Forward (1958–60), a period in which the Chinese leadership forced a manic speedup in the tempo of industry and agriculture and goaded Moscow into withdrawing its technicians; the period of recovery and readjustment (1961–65), in which the economy pulled back from the brink of starvation, but only through the annual import of 5 to 6 million tons of capitalist grain, a reversal of agricultural policy, and the postponement of industrial goals; and, finally, the present period of the Proletarian Cultural Revolution (1966—), which has seen frenzied attacks against bourgeois, scientific, and managerial people, but as yet has not seen a major shift back toward Leap Forward economic policies.

I. REHABILITATION, 1949–52

A. RESTORATION OF ECONOMIC "LAW AND ORDER"

On October, 1, 1949, the Chinese Communists under Mao Tse-tung established the People's Republic of China with its capital at Peking. The military and political triumph was complete. The new leadership immediately set about to transform China into a modern industrial nation that would dominate Asia and command the respect of the whole world.

Economic policy was seen, not as an end in itself, but as a means of furthering Chinese Communist military and political power at home and abroad. Economic policy for this period of rehabilitation (1949–52) was therefore part of the general Communist policy of con-

solidating power at home and laying the groundwork for the thoroughgoing transformation of Chinese society.

The economy inherited by the new regime was a shambles. Since the fall of the Manchu dynasty in 1911, extensive areas of China had been wracked by revolution, war, lordism, civil war, foreign invasion, and flood and famine. Industry and commerce had almost come to a standstill in major urban centers. The industrial base in Manchuria had been looted by the U.S.S.R. of more than \$2 billion worth of machinery and equipment. Dams, irrigation systems, and canals were in a state of disrepair. Railroad lines had been cut and recut by the contending armies. Inflation had ruined confidence in the money system. And, finally, the population had suffered enormous casualties from both manmade and natural disasters and was disorganized, half starved, and exhausted.

Yet the new Communist regime did have some important assets to bring to the immediate task of rebuilding the country. In the first place, Chinese society for hundreds of years had shown an incredible ability to weather disasters of the magnitude of the period 1911-49. The historical and cultural cement in the Han Empire never seemed to be lost in spite of cyclical political disintegration and the localized nature of most economic activity. Previous dynasties had put the pieces back together again after each time of trouble, and the new Communist dynasty—equipped with modern means of coercion, organization, and communication—was to prove equal to the challenge of rehabilitation.

A second element of stability was the existence of large rural and interior areas of the country that had been relatively free of the disasters enumerated above. In these areas, agriculture, trade, and handicrafts had continued in their age-old patterns, and, whereas some years were good and some bad and some families rose and some fell, the general conditions of life remained stable. A special example of areas that enjoyed a relative stability before Mao's final triumph was the extensive area in the Upper Yellow River Basin that the Communists had seized and had been administering for some years. These areas had benefited from an orderly if severe administration, and the Communist leaders in turn had benefited from the experience of ruling large territories with tens of millions of people.

The first general aim of economic policy after the Communist takeover was the establishment of economic law and order. The brutally direct command structure of the Communist regime was especially well suited to carrying out this objective, and in a remarkably short time the new government had—

- suppressed banditry.
- restored the battered railroad system to operation.
- repaired and extended the badly neglected system of dikes.
- replaced the graft-ridden bureaucratic system of local government with apparently incorruptible Communist "cadres."
- introduced a stable currency and enforced a nationwide tax system.
- began an extensive program of public health and sanitation.
- provided a tolerably even distribution of available food and clothing.

B. ESTABLISHMENT OF CONTROL OVER THE COMMANDING HEIGHTS OF THE ECONOMY

The restoration of the workaday activities of peace went hand in hand with the establishment of central economic planning and control in Communist China. Whereas political and military control went down to the smallest village and last urban block, economic control at first was concentrated on the commanding heights of the economy, such as the railroad system, the banking system, and steel and other key industries.

Control of the commanding heights was in itself little different from the situation prevailing before the establishment of the Communist regime. The Nationalists, and the Japanese before them, had imposed close government control, if not outright government ownership, on major industrial, financial, and commercial enterprises. However, for the Communist regime this control was merely a prelude to the thoroughgoing transformation of the economy into a command economy patterned after the economy of the U.S.S.R.

In these first years of Communist rule, the amount of economic control diminished as one went from the center to outlying areas or from modern industry to handicraft industry to agriculture. The new government had only finite resources for administering the economy. From the start, it insisted on complete political and military control but had to be content to leave control over economic details till later.

An example of how control from the center gradually tightened is to be found in the organization of agriculture. In the early years of the regime perhaps 2 million rural landlords and rich peasants were slaughtered as enemies of the revolution, and the land was divided up among the poorer peasants. However, the peasants were not long left undisturbed. Mutual aid teams were formed under the pressure of the Communist command structure; groups of peasants pooled their labor at various seasons but with no sharing of income or property. Later, lower level cooperatives were set up; land was used jointly but each peasant received income from the land he had contributed. The next stage was the higher level agricultural producer cooperative (APC), similar to the Soviet collective farm, in which land was owned collectively and brought no income to the former owner. In 1958 there was the supercollective or commune, which will be described later.

C. THE ECONOMIC EFFECTS OF THE KOREAN WAR

From October 1950 to July 1953, the new regime engaged United Nations (mainly U.S.) forces in large-scale warfare on the Korean Peninsula. This major war had little long-term effect on the Chinese economy or on Chinese economic policy. From the political point of view, some observers hold that the Korean war was a tremendous boon for the new regime, boosting production under the slogan of "Resist America, Aid Korea," and uniting the country in a national effort against the world's foremost military power.

Why was the Korean war relatively neutral in its long-term economic effect on Communist China? First, the Chinese already had in being a ground army of around 5 million men led by an able experi-

enced officer corps. Second, the severe casualties sustained by the army in the fighting were small in relation to the population of China, then 550 to 600 million. Third, as supplies of weapons captured in the campaigns against the Japanese and the Nationalists were depleted, the U.S.S.R. filled the breach as the chief source of the materiel for the Chinese Army. Fourth, the United Nations forces fought the war under restrictions of limited engagement and did not bomb Chinese military and industrial target or otherwise engage the enemy in ways that would have damaged the economy.

D. APPRAISAL OF PERFORMANCE

Chinese economic policy in the period of Rehabilitation (1949-52) gets full marks for drawing all China together in one national economic unit and laying the groundwork for the transformation of the economy to a Soviet-type command economy. The objectives of this period—the establishment of economic law and order, the seizure of the commanding heights of the economy, and the restoration of existing productive facilities—were all achieved.

The Chinese Communists came into a situation that was in a state of almost complete flux. They used their unique opportunity to dictate the pattern of change at a time when the pieces could have been assembled in many widely divergent ways. They built a strong foundation of national pride by setting up a powerful all-Chinese government which had cast out the foreign powers and then successfully defied them in Korea. Even those surviving property owners and intellectuals who had suffered personal losses and indignities under the regime still felt this pride in China's resurgence.

A major economic result of the successful rehabilitation was a temporary relaxation of the jaws of the Malthusian trap. Up to the time of the new regime, the familiar checks of war, famine, and disease had kept the population within the bounds of current food production. Now suddenly, the new regime had welded the country into a national unit and had greatly increased the effective capacity and the output of the economy. Production temporarily was in excess of minimum consumption needs. There now existed the possibility for net investment which could build up industry and provide support for agriculture, science, exports, more industry, and so on. There was even the prospect for urbanization, and, ultimately, a fall in the birth rate.

But the regime had to move fast. All the fertile land in China was already in use and was already being worked intensively. Very little additional output would result from applying more labor to the land, once the nonrecurring gains of peace had been achieved. Furthermore, the elementary discipline in health and sanitation that the regime quickly imposed on the country led to a sharp drop in the death rate; the Malthusian trap would quickly close again in the absence of rapid and large-scale industrialization. In this matter the Chinese Communists were victims of their own success. Through their public health program and their ability to get food to disaster areas, they kept people alive. Although the leadership was ruthless enough, if it so wanted, to let millions starve in order to import mili-

tary equipment and industrial facilities essential for the production of modern armaments, there were practical political reasons why Parson Malthus' dismal remedies were not open to them.

II. THE FIRST FIVE-YEAR PLAN, 1953-57

A. SELECTION OF THE SOVIET ECONOMIC MODEL

The first stage (1949-52) had seen the new government consolidate control over the economy, restore the small industrial base, and provide a minimum ration of food and clothing for the population. The second stage, the period of the First Five-Year Plan (1953-57) was the beginning of forced-draft industrialization in the Soviet style. Economic policy was directed to the rapid expansion of capacity and output in basic industrial commodities—steel, coal, electric power, petroleum, cement, and the rest. Concurrently, a beginning was made in the machine building and armaments industry. In transportation, the completion of a major bridge at Wuhan linked up the rail systems of north and south China; a major program of double tracking existing rail lines was undertaken; and new lines were pushed toward the remote provinces of the west. Agriculture had the three-fold task of feeding the rapidly growing population (including the new urban population), supplying large quantities of raw materials to industry, and providing exports to pay for imports of military and capital equipment and industrial raw materials.

It was natural that the Chinese Communist leadership should look to the U.S.S.R., the first Communist state, for its economic strategy. In political ideology and economic objectives, the U.S.S.R. in many respects was the only model for Communist China to follow. An even more compelling reason was that the U.S.S.R. stood ready to support China in its industrialization, and Soviet aid was especially effective because it was to be received in one huge politicoeconomic bundle. As Mao Tse-tung put it in September 1956, "We must be good at studying. We must be good at learning from our forerunner, the Soviet Union * * *"¹

The features of Soviet-style industrialization that Communist China adopted were—

- the notion of a central economic plan covering a 5-year period and prescribing rates of growth for major industrial and agricultural products as well as rates of growth for all other branches of economic activity.
- the principle that investment should have priority once minimum defense and consumption needs had been met; also, a corollary principle that in the event of lags in the plan, additional resources would come out of the hide of the consumer and only *in extremis* out of the military establishment.
- the precept that investment in industry should outrank investment in agriculture and that, within industry, investment in heavy industry should be several times as great as investment in light industry.

¹ Eighth National Congress of the CCP, *Documents*, vol. I, p. 10. Foreign Press, Peking, 1956.

- the policy of running the whole economy at full throttle, that is, of pressing managers and workers to increase physical output to the outermost limits of capacity.
- the reliance on a centralized organization of production, under which large ministerial bureaucracies ran each branch of industry (steel, coal, petroleum, etc.) from offices in Moscow or Peking.

Under a series of agreements that began in 1950, the U.S.S.R. agreed to transfer to Communist China in the course of three 5-year plans (1953-67) (1) a package of 300 industrial plants worth a total of about \$3 billion, (2) a high proportion of the whole spectrum of Soviet technology, and (3) the administrative know-how necessary for running a modern economy. By the end of 1967, Communist China was to have 300 modern steel mills, electric powerplants, machine-tool plants, aircraft plants, chemical plants, electronics plants, and agricultural machinery plants. All these plants would be dovetailed together as suppliers and customers of one another—for example, the Soviet plans for Chinese industrialization presumably had steel mills “coming in” at the right time to supply newly commissioned machine-tool and agricultural equipment plants.

The road to progress being strewn with the bones of dead pioneers, the Chinese Communists were in the enviable position of skipping the costs and delays involved in (a) research and development, (b) design and blueprints, and (c) testing and evaluation. History gives no parallel example of a nation being offered a complete industrial system on a platter. The timing was particularly auspicious. Each of the Communist giants was able to furnish what the other badly needed. The U.S.S.R. was the beneficiary of what seemed to be a once-in-a-century geopolitical triumph—the extension of the rule of communism over a huge chunk of the Eurasian land mass which includes one-quarter of mankind. By the 1950's the U.S.S.R. had recovered from the damage of World War II and was in a position to supply China with the machinery and equipment and the technicians and blueprints that would bring China rapidly into the company of modern industrial nations. By and large, the U.S.S.R. was best at producing large quantities of crude but serviceable machinery and equipment. Communist China, on its part, had the nucleus of an industrial base, the nucleus of a skilled labor force, and a ruthlessly determined leadership; it was in a position to absorb the basic machinery and equipment that the Soviets had to offer. China could be a powerful junior partner in a Sino-Soviet alliance, provided it remained willing to accept a subordinate role.

Chinese Communist economic policy, then, was to rely on Soviet economic assistance for a rapid-fire development of Chinese industry. On what terms was this assistance to be paid for? The question of Sino-Soviet financial relations is complicated by payments made by the Chinese to liquidate the Soviet share in several joint Sino-Soviet stock companies and to pay for certain Soviet assets in Port Arthur (turned over in 1954) as well as possible payments made for Soviet supplies sent to the Chinese army in the Korean war. The accumulated Chinese debt to the U.S.S.R. through 1960 was only about \$1.5 billion, and less than one-third of this debt was connected with eco-

conomic assistance. By the end of 1964 the Chinese had paid off the debt to the U.S.S.R. In contrast, Indonesia and other underdeveloped countries have incurred such huge debts for economic and military assistance that they now cannot meet their payments. In return for Soviet machinery and equipment, China exported to the U.S.S.R. specialty foods, textiles, and processed ores, notably tin, antimony and tungsten.

The broad outlines of trade between the U.S.S.R. and Communist China in this period are known through the annual Soviet trade handbook. Apparently, the terms of trade roughly reflected world market prices. But if prices in this trade were fair, the economic benefits from the trade were wildly asymmetrical. The U.S.S.R. exported to China machinery and technicians that were needed at home, but that constituted only a fraction of Soviet production. In return, the U.S.S.R. received valuable raw materials and consumer goods that were a welcome addition to a drab standard of living. These products could have been produced within the U.S.S.R. only with a troublesome transfer of resources. From the gross economic point of view the Soviets were neither better nor worse off from the trade. Communist China, on the other hand, benefited enormously. The machinery imported from the U.S.S.R., if it could have been manufactured at all within China, could have been produced only at astronomical costs and with long delays. Such production would have required the scarcest and most costly manpower and industrial facilities within China. If there were to be any industrialization under these conditions, China would have to forgo the consumption of great amounts of foodstuffs, textiles, and other domestically produced goods. But with the option of trade with the U.S.S.R. open, the Chinese could export a small quantity of foodstuffs, etc., to get the required industrial equipment. The cost of industrialization measured in these goods was an outstanding bargain in this case.

B. POLICY TOWARD LOCATION OF INDUSTRY

The small industrial base, largely inherited from the Japanese, was located in Manchuria and around Shanghai and Tientsin. The Chinese Communist leadership early decided that industry should be decentralized, that great new industrial centers should be built in interior areas. Presumably, the leadership was concerned both with the dispersal of industry as a military precaution and with the desirability of industrializing the whole country on the basis of large regional centers of industry. This diffusion of industrial activity had been the normal course of events in the process of industrialization of the United Kingdom, the United States, and the U.S.S.R. Furthermore, the Soviet-sponsored development plan for China automatically called for several major regional steel centers, ore-processing facilities at points of ore extraction, and the like. Thus there was going to be a spreading out of industry in any case.

The location of the small pre-Communist Chinese industry had been dictated by the geography of special trading concessions wrung out of China by powerful maritime nations such as Japan and the United Kingdom. Very little industry of any importance was far from terri-

tory policed by foreign gunboats. The new economic development plan could and did take advantage of China's rich resources lying in the interior. For example, the huge electric powerplant at the San-Men Gorge on the middle reaches of the Yellow River was possible under China's new conditions. To put it another way, the First Five-Year Plan gave Mao and his colleagues the opportunity to say where new industrial capacity was to be located, and many other reasons beside an economic policy of decentralization of industry dictated their decision to build a great aluminum plant here or a new agricultural equipment plant there.

The leadership went too far, however, in its eagerness to build up capacity in the interior. For example, new textile plants were built in inland cities and managers and workers were transferred from Shanghai, while capacity in Shanghai lay idle. Finally, by 1956 the leadership realized that what they really wanted was to modernize capacity and build up production in the old centers at the same time that most of the big new plants were being constructed away from the old centers of industry. After this turnabout in policy, production in Shanghai was pushed toward capacity, but large new plants were located elsewhere.

Another factor in location of industry is transportation. Before 1949, China faced eastward toward the ocean in its foreign commercial dealings. Under the new Communist government, transportation links with the U.S.S.R. suddenly assumed much greater importance. One major rail connection with the U.S.S.R. already existed in Manchuria and a second was forged by the completion of the trans-Mongolian railway in 1955. A third rail link, to the northwest to pass through Sinkiang Province and the Dzungarian Gap reached Urumchi in the 1960's but further construction ceased because of the Sino-Soviet rift. The linking of the rail systems of north and south China, in the interior, also was a factor influencing the development of large industrial centers.

C. AGRICULTURE AS A HOLDING OPERATION

The Chinese Communists did not try to begin the large-scale mechanization of agriculture in the First Five-Year Plan period and this was sound economic policy. Industrial effort had to go toward expanding the industrial base. Machines in agriculture would only displace men, not raise output. And there were plenty of men.

Agriculture was to continue to benefit in this period from the restoration of peace and the establishment of a strong central government. Continued improvement in flood control and irrigation systems depended on the organization and discipline of large bodies of men; the new government was well-suited for this kind of task. Of course, it could not prevent dips in production caused by flood and drought but it could reduce losses and take care of the victims.

Another major line of improvement in agriculture was largely beyond the capacity of the economy in this period; namely, the development and application of improved techniques of production, especially the increased use of chemical fertilizers and the introduction of superior strains of rice and other crops.

The policy of gradually tightening the Government's control in agriculture through imposing "higher and higher" types of collectivist organizations on the countryside has been sketched previously. Individual ownership gave way, step by step, until finally Chinese agriculture was organized under the Soviet-style collective farm and, as in the Soviet case, a residuum of private cultivation and private trading was tolerated as an effective way of filling in "interstices" in the economy. The effect of this collectivist policy varied considerably from one area to another and from one crop to another. The policy lost some of its force as it came down through party and Government channels, and the new way of life seems to have been introduced in jerky fashion; campaigns for further collectivization would run their course, followed by periods of pragmatism and backsliding.

D. APPRAISAL OF PERFORMANCE

In this period also, the Chinese Communist leadership should be graded high for its economic policy and its economic achievements at this stage of its development. The proof is in the following production figures for basic industrial items, at the beginning and at the end of the plan:

Item	Unit	Output 1952	Output 1957
Crude steel.....	Million metric tons.....	1.35	5.35
Coal.....	do.....	66.5	130.7
Petroleum.....	do.....	.44	1.46
Electric power.....	Billion kilowatt-hours.....	7.3	19.3
Cement.....	Million metric tons.....	2.9	6.9
Sulfuric acid.....	Thousand metric tons.....	190	632

In addition to a several fold increase in the production of major industrial products, the Chinese Communists with Soviet help also—
—modernized and increased the capacity of major branches of industry.

- trained thousands of skilled and semiskilled industrial workers.
- laid the groundwork for a Soviet-type planning and statistical system.
- obtained sufficient growth in agriculture to keep up with the growth of population.

The economic policy of the First Five-Year Period of "learn from the Soviet Union" was an excellent choice, given the Chinese Communist military and political goals and given the practical alternatives. If the Malthusian trap were not to close, industrialization had to be achieved without delay, had to be conducted on a tremendous scale, had to be simple to administer, and had to be achieved at low cost measured in terms of the food and raw materials China would have to export. The Soviet-sponsored industrial program met all these criteria.

By the end of the First Five-Year Plan period Communist China had achieved an enviable momentum in economic development. This momentum was translated into high morale and enthusiasm among a large part of the population. The goal of the leadership, however,

was to make China into a self-sufficient industrial power. How was almost total dependence on the U.S.S.R. compatible with the aim of self-sufficiency? In the first place, the mutual political and military advantages of solidarity between the two giants of the Communist world were enormous. China came under the umbrella of Soviet nuclear power, and the U.S.S.R. enjoyed an almost incalculable increment to its strategic strength by having this huge friendly power on its flank. But more germane to the fundamental economic policy of the Chinese Communists is this: The surest way of ultimately attaining status as the third superpower was to remain under Soviet tutelage at least until 1967; that is, through three 5-year plans. By 1967, the entire 300 major industrial plants would have been completed; the Chinese would have been the beneficiaries of important atomic technology, which the Soviets could find no compelling reason to refuse; the training of millions of industrial workers, technicians, and scientists would have been finished; and the Chinese would have had sufficient experience to run their own planning and statistical systems. All the Chinese Communists needed was patience, a virtue the Chinese are supposed to possess in ample measure. With patience, Communist China by about 1967 would have been very largely self-sufficient.

III. THE GREAT LEAP FORWARD, 1958-60

A. GENESIS OF THE GREAT LEAP

The Chinese Communist leadership intended to follow up the successful First Five-Year Plan (1953-57) with a Second Five-Year Plan (1958-62). The new plan was superseded in early 1958, however, by the Great Leap Forward, a complete turnabout in Chinese Communist economic policy. The Great Leap Forward was an ill-conceived scheme to drive the Chinese economy ahead at a much faster pace; output in industry and agriculture was to be doubled and redoubled in a few short years; seemingly regardless of the effect on men, machinery, and quality of output. Instead of the grateful acceptance of the dour Soviet model of economic development, the new era was marked by fanaticism and sloganeering. "Politics must command economics." "Produce more, faster, better, and more economically." "Catch up with Great Britain in the production of steel and other industrial commodities in 15 years" (later the time span was shortened to 10 years).

Two seemingly contrasting explanations of the Great Leap are available. The first holds that the leadership was so encouraged by the results of the First Five-Year Plan that it was inspired to greatly step up the pace of the economy. The second holds that the leadership was so discouraged by the results of the First Five-Year Plan in relation to China's enormous economic problems that it lashed out in a fit of frustration to get immediate solutions to these problems. These two explanations can be reconciled: (1) The leadership indeed had reason to be pleased with the rapid growth in the economy, yet at the same time the achievements were small in comparison with China's needs, and (2) the leadership was chafing under the brick-by-brick approach of its Soviet mentors. Under this approach, the rate

of economic progress was determined by China's ability to accumulate capital for investment. The Chinese leaders substituted a "mass political" approach that was intended to "liberate" the spiritual energy of all the people and channel it into increased economic activity. However, the leadership misjudged the economic realities of the time and the capacity of the resources at its command. The talents of the leadership that had been military virtues on the Long March to Yenan—and in the final conquest of the Mainland—were not fully transferable in running a large centrally planned economy.

B. ECONOMIC THEORY BEHIND THE GREAT LEAP

The Great Leap concerned much wider issues than economics. Mao and his colleagues have a vision of Chinese society as it should be. The yearnings of the individual Chinese for rest, privacy, and a little more food play no part in this vision. All human and material resources are to be devoted to making China a world power. The Great Leap was to have speeded up this process.

The first major tenet of the economic theory behind the Great Leap was that China's vast population was—contrary to the Malthusian theories of the bourgeois economists—an economic asset. As Liu Shao-chi put it, "Man should be viewed as a producer rather than a consumer."² The more people, the more hands to build socialism. This point of view could hardly be more in error in a country pushing hard against the limits of its existing agriculture to obtain food. A distinction is necessary between the *huge size* of China's population and the rate of growth which adds *tremendous annual increments* to the population. Both aspects are disadvantageous. The huge size is a disadvantage because of the imbalance created between land and capital on the one hand and population on the other. An extra 200 million people (to select an arbitrary figure) crowd the land and add proportionately little to output. The simple numerical illustration below is not to be taken literally, but its relevance is incontestable, provided one basic economic theorem is applicable—that is, the principle of nonproportional ("diminishing") returns. All that is necessary is to accept the notion that once China's land suitable for agriculture is being busily worked, a doubling of the labor force will not double output from the land, because each worker's labor now is being applied in effect to only half as much land. Suppose we have in 1957 the following illustrative situation:

(a) The amount of agricultural land, the level of agricultural technology, and the stock of farm machinery and farm structures are fixed in amount in the short run.

(b) The population is 600 million; the output of grain, which is the only food in this illustration, is 200 million metric tons; and the average person requires one-third of a ton of grain a year for subsistence; all grain is therefore consumed domestically.

(c) A genie is found in a bottle by a poor but honest economist on the coast of the Yellow Sea. At the bidding of the economist—who happens to be the special assistant to the Chairman

² Second session of the Eighth Congress of the CCP, May 1958.

of the State Planning Commission—the genie selects at random 200 million of the Chinese people and makes them disappear.

(*d*) The output of grain is reduced because fewer hands are available at planting and harvesttime and because the quantity of night soil (human manure) falls off. The reduction is only 10 percent, however, because the same amount of land and capital are in use and because the remaining workers are better fed and thus more energetic. Average consumption is now two-fifths of a ton of grain a year. Total output is 180 million tons, total consumption is 160 million tons, and 20 million tons may be traded abroad in return for industrial equipment and cannon. So ends the highly simplified illustration, which does no violence to the basic facts in China.

The rapid growth in population is a related but separate disadvantage. Rapid growth in population means that rapid growth in output of food and clothing is necessary merely to maintain the present low level of living. Increases in production brought about by gradual improvements in agricultural technology and small increases in the amounts of farm machinery and farm structures are offset by the new mouths to feed. To return to the hypothetical numerical illustration and the demographic genie:

(*a*) Population has been cut by the genie to 400 million, but each year 16 million babies are born and only 8 million old people die. Consumption rises by 3 million tons each year, the amount necessary to feed the net addition to the population. At the same time, new agricultural techniques and new investment push production up 3 million tons each year, keeping production abreast of population growth.

(*b*) The economist, still poor and still honest, notes this failure of the agricultural economy to provide increased exports and directs the genie to distribute several million intrauterine devices to the people; population is now held stable.

(*c*) Production of grain continues to rise at 3 million tons a year and exports also rise at a rate of 3 million tons. Growth in population no longer cancels out the growth in production.

A second element in the economic thinking of China's leaders was that China's population, especially in the countryside, was underemployed a large part of the year. In the rural areas, it was argued, there were peak periods of activity during planting and harvesttime but the peasant spent the remainder of the year working far below capacity. Communist organization was the key to the mustering of this unused labor. The off-peak periods could be used for communal labor in—

- constructing dams
- repairing dikes
- digging irrigation ditches
- building roads
- producing industrial or handicraft goods.

The “underemployed” argument was not completely thought out. In the first place, the Chinese peasant family in the framework of the clan village had fashioned over the generations a rhythmic pattern of life, in which many subsidiary activities had been dovetailed in between the peak agricultural periods; the village was largely self-contained

and its members carried on such traditional local activities as making clothing, processing food, building housing, gathering fuel, and conducting petty trade; the trade relations with outside markets were small. Given this reality, any attempt by the Communist government to mobilize what appeared to be underemployed people ran the danger of breaking up well-established pattern of economic activity and of losing considerable local economic output. In the second place, the consumption of food over much of China usually provided for bare subsistence, and any attempt to increase the energy output of large numbers of people would cost large additional amounts of food.

In urban areas, the same dubious economic appraisal was made. Housewives, it was argued, could be drawn into industry at practically no cost and the whole of the urban labor force could readily step up the tempo of work. Insufficient attention was paid to the contribution already made by housewives in the form of domestic production and child care.

A third element of the economic theory behind the Great Leap Forward was the emphasis on ideological motivation compared to the "normal" economic elements of material incentives, steady technological advance on the basis of research and testing, and dry accounting and cost control procedures. A fervid faith and vision of the future had brought the Chinese Communists through the rigors of the Long March and to their sweeping triumphs on the Mainland. The dangers of ideological backsliding were always present, and the Soviet-style industrialization was running the danger of glorifying (and paying a premium to) the successful planner, technician, accountant, and engineer—at the expense of the true believer who was exhorted to sacrifice and practice self-denial in the interest of strengthening the state.

Here the Chinese Communist leadership was grappling with an important aspect of economic theory; namely, motivation—what prompts people to work harder and more efficiently. The outside "bourgeois" observer finds it difficult to identify and to explain just what was bothering Mao and his closest comrades. This same distant observer also finds it difficult to comprehend what moved the old time Muslims suddenly to sweep across the desert exterminating infidels by the thousands. Nonetheless, motivation indeed is important. The Chinese Communist leadership was determined that China would follow Mao's correct path to economic salvation, using the resources at hand. Since heavy construction machinery was lacking, hordes of workers—organized and inspired by the Party—could build the dams or the new steel mills. This was the "thousand ants gnawing on a bone" philosophy.

C. EFFECT ON INDUSTRY, AGRICULTURE, TECHNOLOGY, AND EDUCATION

China had made great strides in industry in the first 8 years under Communist rule but this was not enough. Targets sketched out for a Second Five-Year Plan (1958-62) were swept aside and new Leap Forward targets introduced.

Under standard economic policy, Communist governments call on industry to raise output each year and to bring great new capacity into operation. Output per worker is also supposed to rise at the same time, but often it is only the above-plan expansion of the work force that enables goals to be met. The Leap Forward in China went far beyond

this conventional Communist policy toward industry. Industrial output was to be pushed upward in a sort of religious frenzy, almost regardless of the cost in terms of (1) lower quality, (2) exhausted workers, (3) worn-out machinery, and (4) unusable product. Steel produced in thousands of backyard furnaces lay unused or had to be remelted as a charge in other furnaces. Coal dug out of the earth at a furious pace contained large quantities of dirt and rock and could not be used efficiently.

Communist countries have sometimes been able to make spectacular percentage gains in output by concentrating resources and managerial efforts in a narrow sector of industrial output. Agriculture, however, presents a much more difficult problem because normally it is impossible to rapidly increase key resources such as land and water or to rapidly introduce more efficient factory-style methods of production. During the Leap-Forward, the Chinese Communist leadership scoffed at these lessons of history and announced that both agriculture and industry would expand at a lightning pace.

The central economic policy for agriculture was the formation of super collectives—or communes—each averaging about 25,000 people. The commune was the multipurpose unit of local administration in rural areas. Not only was it responsible for agricultural production but also for industry (food processing, handicrafts, repair shops, and even little outposts of heavy industry such as the backyard furnaces, trade, water conservation, transport, and the militia). Each commune was supposed to be a large pool of highly motivated workers who could be shifted from one large task to another. The Communist leadership had in mind some crude notion of economies of scale from a unit large enough to tackle, say, major irrigation projects. The commune was the highest form of collectivist agricultural organization yet sponsored by the Government. It was to be the vehicle for the transfer of the whole society from socialism to communism, with the resultant abolition of wage differentials.

The get rich schemes for agriculture included deep plowing—the depth of a furrow was to be increased from less than 1 foot to as much as 6 feet—and close planting—rice seedlings to be planted 1 to 2 inches apart instead of 5 to 6 inches. Besides these changes in technology, there was to be a gigantic water conservation effort; hundreds of irrigation systems were to be repaired and extended, and dams and dikes were to be built to reduce damage from floods.

The Leap Forward in agriculture resulted in the most bizarre statistical event in the whole Chinese Communist administration. Production of grain in the bumper crop year 1958 was announced as 375 million tons, or more than double the 185 million tons of 1957. If this were the case, the population should have had plenty to eat, and indeed some communal messhalls began serving meals on an as-much-as-you-can-eat basis. In August 1959, serious statistical errors by over-enthusiastic local officials were admitted and the claim for grain production in 1958 was lowered by one-third, to 250 million tons. This figure was still far too high. To judge from food shortages and other independent evidence, a reasonable estimate for 1958 is about 200 million tons.

The Great Leap Forward penetrated almost every aspect of Chinese Communist life. Technology acquired an ideological dimension.

Rank-and-file workers and peasants were urged to create inventions *en masse*, and each local political unit announced that so-and-so many hundreds of inventions had sprung from these untutored sources. Educational standards were sacrificed in two ways. The quality of education was diluted by the introduction of new political indoctrination courses, and the demand for thousands of trained workers to meet skyrocketing plans in industry and agriculture resulted in drastic educational shortcuts.

D. WITHDRAWAL OF THE SOVIET TECHNICIANS

From the start, the Soviet leadership was nettled by the Great Leap Forward. The Soviet leaders resented the claim that communes were an advanced stage on the road to communism, a stage that the U.S.S.R. had not yet reached. Khrushchev growled that the U.S.S.R. had tried communes and found they wouldn't work. The Soviet press suggested that China's economy had a long way to go before such presumptuous experimentation was proper.

The Soviet leadership was concerned about its political and economic investment in Communist China. The U.S.S.R. was sponsoring a rapid fire but fully realistic industrialization program for China. Thousands of Soviet technicians had gone to China to help; thousands of Chinese technical students had gone to the U.S.S.R. for training. Chinese scientists were even working with Soviet scientists in the nuclear research laboratory at Dubna, near Moscow. Politically, the U.S.S.R. was prepared to use this economic dependence as a lever to gain Chinese adherence to Soviet policies.

In spite of Soviet hints that Chinese continuance of the Leap Forward could jeopardize the Soviet aid program, the Chinese persisted. But as the Leap Forward went on and as general relations between the U.S.S.R. and Communist China deteriorated, the aid program began to suffer. After the purge of Marshal Peng Te-huai in August 1959—ostensibly for criticizing the Leap Forward—Chinese managers and technicians in the new Soviet-aid plants or at the new construction sites began to turn deaf ears toward their Soviet mentors. The Soviet technicians were handed leaflets giving the Chinese side of the Sino-Soviet dispute. Khrushchev moved to exploit Soviet leverage upon the Chinese leadership, and in July 1960 the Soviet technicians were summarily withdrawn from China. They took their blueprints with them. Now it was up to the Chinese, armed with the spirit of self-reliance, to complete the construction projects, to operate already completed plants without Soviet troubleshooters on the production floor, to make their own blueprints, to find their own spare parts, and to balance outputs of all supplier plants against the requirements of user plants.

These things the Chinese could not do, the Leap Forward spirit notwithstanding.

E. THE WINTER OF DISCONTENT, 1960-61

The gap between total production and the subsistence requirements of the people, which had opened after 1949 with the coming of peace, now closed. Two poor harvests in 1959 and 1960 resulted in a dang-

erous cut in food rations. The winter of 1960-61 marked the lowest point in food rations under the Chinese Communists. It is the only period when visitors to Communist China detected signs of widespread malnutrition. It was a time of greatly weakened resistance to disease, of grave discontent among the population which affected even the army, and probably of numerous outright deaths from starvation. The Great Leap Forward was at an end. A new economic policy was necessary—at once. This new policy is the subject of the next chapter.

F. APPRAISAL OF THE GREAT LEAP FORWARD

The Great Leap Forward was a manmade disaster for Communist China. The name of the man was Mao Tse-tung. The formidable economic momentum built up during the first 8 years of the Communist regime was lost. The Leap Forward had no redeeming economic feature:

- In agriculture, spurious new methods of cultivation led to unnecessary work for the peasants and lowered the quality of the land; the new communes ruptured proven and efficient production patterns in rural areas and led to poor harvesting and lack of concern for the land.
- In science and education, the Leap Forward substituted political rhetoric for laboratory research and careful education; educational standards were diluted and thousands of half-trained people let loose on the economy.
- In economic planning and statistics, the new Second Five-Year Plan was superseded by manic Leap Forward planning methods, and statisticians were enjoined to make the figures back up political guidelines; for example, the output of grain in 1958 was reported at nearly double what it really was, and the claim for output of coal covered a great amount of dirt, rocks, and thin air; the fledgling Soviet-style statistical system was swept away, not only because politics command statistics but also because statisticians like other office workers were pressed into service as frontline workers in industry and agriculture.
- In economic development—and this was the most unkindest cut of all—the Leap Forward ultimately resulted in the withdrawal of Soviet economic aid; of the 300 modern plants to be built with Soviet help by 1967, about half were in operation when the Soviets pulled out; the Chinese sometimes could not continue operating the completed plants without Soviet troubleshooters and spare parts; much of the capital plant built up over the past 8 years and paid for by down-to-earth sweat and iron rations suddenly became useless.

IV. RECOVERY AND READJUSTMENT, 1961-65

A. FORCED RETREAT IN ECONOMIC POLICY

The Leap Forward debacle set the stage for the next period in Chinese Communist economic policy—the period of Recovery and Readjustment, which lasted 5 years—1961-65. The new economic policy was at first one of simple survival but gradually during the period

there was recovery in industrial production. The end of the period saw the spectacular success in setting off China's first nuclear devices.

During this period of recovery the Chinese Communist government issued practically no statistics on the economy. In contrast, during the First Five-Year Plan (1953-57) the government had begun to issue annual reports on the progress of the economy and each succeeding report had been more detailed as the statistical system extended its tentacles farther into the economy. By the end of 1957, information was officially released on the output of several dozen major industrial and agricultural products and on several dozen major Soviet-aid investment projects. The prostitution of the statistical system for ideological purposes during the Leap Forward (1958-60) has been described briefly. There were many bombastic statistical releases, but their implausibility quickly discredited them. After the demise of the Leap there was a sullen statistical silence which has continued almost unbroken to the present day. Even when the worst of the crisis had passed, Premier Chou En-lai and other top officials only occasionally provided very general appraisals of the economic situation. On the whole, the period of recovery saw little but vague claims of improvement in food supplies, in industrial output, and in the level of technology.

During this 1961-65 period of recovery then, the economic analyst working on Communist China had a difficult time in assessing economic performance and the effect of economic policy. It was as though he were looking at a black box, from which came only muffled rumblings. The analyst benefited, however, from one palpable series of outside events; each year starting in 1961 China imported 5 to 6 million tons of grain from the capitalist world at an annual cost of \$300 million to \$400 million. This import of grain clearly demonstrated the strategic failure of the Leap Forward.

The analyst had the further benefit of three puffs of white smoke coming from the box—in October 1964, in May 1965, and in May 1966. Whereas the import of large quantities of grain gave sure evidence of the Malthusian dilemma, the ability to set off three nuclear blasts was important evidence as to the continued development of military industry and technology on a narrow but important front.

The period of Recovery and Readjustment marked above all a forced retreat from the disastrous economic policies of the Leap Forward period. It marked a change in economic priorities and in the style of economic management. The new economy policy:

- placed first priority on the restoration of food consumption to the subsistence level.
- continued the emphasis on China's development as a nuclear power on the (correct) assumption that available resources were sufficient not only to restore the essential supply of food but also to pay membership dues in the nuclear club.
- simplified economic planning and kept it on a year-to-year basis.
- abandoned the claptrap about the value of China's enormous population and began quiet support for a program to reduce its rate of growth.

—reduced the scope of economic development and indefinitely postponed the day when China would overtake such developed economies as Great Britain, West Germany, and Japan.

B. INCREASED PRIORITY FOR AGRICULTURE

During the period of Recovery and Readjustment, numerous statements appeared in the official press to the effect that economic priorities had been reshuffled and that agriculture and the industries supplying agriculture were now to get top billing. Emphasis was to be placed on insuring the supply of food by concentrating rural labor on the growing of food crops (as opposed to the confusing multiplicity of goals for rural labor under the Leap Forward), by commissioning industry to supply more fertilizer and irrigation pumps to agriculture, and by using scarce foreign exchange to import grain. What had happened was that the Leap Forward had overstretched China's resources and in the process had reduced China's production possibilities at the same time that minimum subsistence requirements were inexorably rising. The Malthusian trap was closing.

A major change in agricultural policy was the almost complete abandonment of the ill-fated communes. Responsibility for production was shifted down to smaller and more manageable units, namely, the production brigade (consisting usually of several villages) or the production team (one village). Trading, banking, and statistical activities were taken away from the commune and returned to the control of the brigades and teams and the local offices of the Ministry of Finance and the central statistical administration. Industrial activity in rural areas reverted to traditional forms, with emphasis on handicrafts and local food processing. The commune thus was stripped of many of its functions but still retained its administrative identity; it still was cited in propaganda as a "good thing"; yet it had faded away till, like the Cheshire cat, nothing was left but its grin.

In place of the discredited technical campaigns of the Leap Forward for deep plowing and close planting, emphasis now was placed on learning from old farmers. In place of the shortsighted denunciation of private agricultural plots, peasants were permitted to till small pieces of land and keep pigs and fowl; needless to say, this pragmatic concession to individual initiative was of great importance in restoring food production after the bleak winter of 1960-61. In place of the policy restricting petty private trade and handicrafts, more freedom was conceded to market goods locally and to produce farm tools, clothing, and household utensils. These sensible changes in policy, however, merely gave back what the Leap Forward so improvidently had taken away.

C. DEVELOPMENT OF INDUSTRY ON A NARROW FRONT

In the period of Recovery and Readjustment, the policy for industry was to pick up the pieces, that is, to restore production in those areas of greatest national importance and to restore the quality of output. Instead of a broad program of industrialization, as sponsored by the U.S.S.R. before the withdrawal of Soviet support in mid-1960, the

Chinese leadership had to be content with advance on a narrow front. Foreign support was confined to the import by China from capitalist countries of a few key industrial plants in chemicals, petroleum refining, and machine building. By the end of 1965, approximately 3 dozen key plants had been delivered or were scheduled to be delivered from Japan, Great Britain, Italy, France, and other Western European countries.

The new economic policy of this sobering-up period called for industry to support agriculture. Accordingly, the expansion of production and capacity in the chemical fertilizer industry and in certain branches of the agricultural equipment industry had the green light. The production of tractors, combines, and other large farm equipment was not emphasized, and rightly so; fertilizer and pumps for irrigation would increase yields, whereas tractors and combines would only displace men.

A second area of priority for industry in this period was the support of a narrow program of production of modern weapons. The construction and operation of facilities producing nuclear materials, the revival of domestic aircraft production, and the continued production of small arms are cases in point. In the armaments industry, the Chinese Communists worked from the half-completed base furnished by the U.S.S.R. Furthermore, even after the peremptory withdrawal of its technicians, the U.S.S.R. continued to furnish a dribble of technical support to China—for example, the final group of Chinese scientists left the nuclear research center at Dubna in the U.S.S.R. as late as 1966. Spare parts for industrial rehabilitation were also available in the U.S.S.R.

A third area of priority was petroleum refining—an area in which military prudence required that Communist China achieve self-sufficiency at a reasonably rapid pace. By 1965, China was working new oilfields, bringing new refining capacity into operation, and broadening the range of products over which it had technical mastery.

In contrast to the situation during the Leap Forward, an appreciable share of Communist China's industrial capacity was left idle during the period of recovery and readjustment. This partly was a legacy of the Soviet withdrawal. Electric power capacity, for instance, had been built up in anticipation of high future demand by the aluminum, machinery, armament, and other industries. The end of the Soviet-aid program and the general collapse of the Leap Forward left some electric power capacity idle. Similarly, capacity in the textile industry had been expanded beyond the ability of the post-Leap economy to supply raw materials. As industrial production gradually recovered in 1961-65, much of the idle capacity was brought into operation.

D. CHANGE IN ATTITUDE TOWARD POPULATION

The about-face in economic policy in this period included a much clearer appreciation of the danger posed by China's rapidly growing population. Now at last the regime was willing to concede that an attack on the population side of the equation was desirable. However, the regime did not push birth control until near the end of this period. Population in the period rose from an estimated 690 million at the

beginning of 1961 to 760 million at the end of 1965, or at an average annual rate of 2 percent.

E. APPRAISAL OF RESULTS

Economic policy in the period of Recovery and Rehabilitation met the minimum aims of the regime. Communist China drew back from the edges of mass starvation and mass rebellion. Essential food supplies were restored by prompt and continuing imports of grain as well as by concessions to private agriculture that cost the regime nothing economically. Industrial production in many sectors recovered to pre-Leap levels and in some instances—for example, petroleum and chemical fertilizers—showed large increases. Support for China's nuclear program continued, and impressive progress was made, particularly in view of the general political and economic reverses suffered by China. On the negative side, population continued to grow rapidly, and there seemed to be no immediate prospect for obtaining a safe margin of food production.

V. PROLETARIAN CULTURAL REVOLUTION, 1966-?

A. UNCERTAIN STATUS OF THE THIRD FIVE-YEAR PLAN

In the 1961-65 period, the Chinese Communist leadership had been practically forced to conduct economic planning on a year-to-year basis. As the regime regained control of the situation and achieved some forward progress, it began to prepare for a Third Five-Year Plan. Premier Chou En-lai in a speech in December 1964 alluded in very general terms to a plan being drawn up to cover the period 1966-70, but nothing is known about the plan itself. The plan almost certainly is not a detailed economic blueprint like a Soviet 5-year plan but rather a preliminary sketch of major economic policy and of output goals for key commodities. There does not seem to be, for example, a detailed 5-year plan for even major industrial establishments.

The year 1966 opened blandly enough. The economy of Communist China was continuing its steady recovery but with no sign of genuine economic momentum. Industrial production was continuing to increase, but Chinese buyers were continuing to scour the grain markets of the West. There were rumblings in the official press about the resurgence of a capitalistic spirit, especially in agriculture (private plots) and trade (petty merchandising), but the leadership did not seem ready to sacrifice vital food supplies for ideological purity. In similar fashion, the regime seemed willing to continue with the import of modern chemical plants and other industrial facilities from Japan and Western Europe and to allow foreign technicians to enter the country to install the new equipment. Economic policy still seemed to reflect the sober and pragmatic spirit of 1961-65.

B. LAUNCHING OF THE PROLETARIAN CULTURAL REVOLUTION

But something happened to China on its way to the Third Five-Year Plan—namely, the “Proletarian Cultural Revolution.” Erupting in the spring of 1966, this revolution has shaken the political struc-

ture of China more violently than the upheavals of 1953 (dismissal of Kao Kang and Jao Shu-shih) and 1959 (the Peng Te-Huai case). The Proletarian Cultural Revolution is a convulsive (and probably final) attempt by the 72-year-old Mao to cast all of Chinese society into a mold of his own pattern which will endure long after his death. Up through September 1966, the Revolution has gone along these lines:

- a renewed call to study the “thought of Mao Tse-tung” as the ultimate truth and the ultimate inspiration for solving all problems from selling watermelons to setting off nuclear explosions.
- a revived emphasis upon “spiritual” incentives and on the supremacy of political ideology and a corollary denunciation of those who give first place to material incentives and to mere expertness or scientific techniques. “Oppose using material incentives to corrode the revolutionary will of the masses, and prevent scientific and technical experts from being spiritual aristocrats sitting high about the workers and peasants * * *”
- the closing of high schools and universities until their curriculums can be “revolutionized.”
- a continuing reshuffle in the status of the top leaders, with the Defense Minister, Lin Piao, emerging as the man chosen to uphold Mao’s vision of the future.
- an insistence upon a whitewashing of the former Great Leap Forward as an “absolutely correct” course which was the fruit of Mao’s thinking.
- a revitalized campaign against “bourgeois” and “revisionist” influences, which has been entrusted to teenage activists dubbed “Red Guards”; the campaign has taken the form of eradicating “Beatle” haircuts and Hong Kong tailoring, of roughing up foreign diplomats and domestic “enemies of the regime,” of entering private homes and seizing jewelry and other bourgeois possessions, and of eliminating place names and titles that have ancient Chinese or foreign connotations and replacing them with more “revolutionary” names; old revolutionaries and important local Party leaders have been numbered among the victims of the Red Guards.

At the time of writing (end of September 1966) there are as yet few indications that the Proletarian Cultural Revolution will supersede the Third Five-Year Plan in the way the Great Leap Forward superseded the Second Five-Year Plan in 1958. The aims of the Proletarian Cultural Revolution have been mainly political, and the regime has attempted to insulate the economy from its effects. The Revolution has not taken an even course. It has flared up to claim major victims like Peking’s party boss, Peng Chen, and then has quieted down for a time; it has unleashed the youthful Red Guards, who later have been cautioned against overzealousness in punishing enemies of the revolution; it has attacked the spirit of concentration on technical excellence at the expense of personal political involvement and yet has moved to protect leading scientists and managers. On balance, the substitution of ideological cant for logic and reason cannot help but produce economic disruption. The uncertainty is how much.

C. COMPARISON OF THE ECONOMIC SITUATION IN 1966 WITH 1958

The economic situation in Communist China in 1966 is less propitious for a leap forward than it was in early 1958 before the Great Leap. The following table compares the two situations:

Communist China: Some key comparisons of 1958 with 1966

1958	1966
1. Mid-year population of about 655 million.	1. Mid-year population of about 770 million; 115 million more people to feed.
2. Small exports of grain and other food-stuffs.	2. Annual imports of 5 to 6 million tons of grain at cost of \$300 million to \$400 million in hard currencies.
3. Rapidly expanding industrial production.	3. Steadily but much more slowly expanding industrial production; recovery of output to roughly the 1957-58 level.
4. Bumper crop in agriculture.	4. Below-average crop expected in agriculture.
5. Large-scale Soviet support for a broad industrialization program involving 300 modern plants.	5. Narrow Western support in form of several dozen modern chemical and other industrial plants.
6. Training of thousands of scientists, engineers, and technicians both in the U.S.S.R. and China under Soviet instructors; advance of technology on a wide front.	6. Technical training of thousands of people using domestic resources only; some successes in mastery of nuclear technology; universities and high schools currently disrupted.
7. High morale and pride in China's achievements under the new government.	7. Indifferent morale and an apathetic spirit.

D. EFFECT OF THE WAR IN VIETNAM ON THE ECONOMY

The rising tempo of the war in Vietnam has not as yet strained the economic resources of Communist China. So far China has—

- furnished large quantities of small arms to the Communist forces in Vietnam.
- provided rail transport for large shipments of Soviet air defense and other equipment going to North Vietnam; this service, however, is not given free to the U.S.S.R.
- dispatched significant numbers of engineering troops to aid in the building and repair of roads, bridges, and rail lines in North Vietnam.

Thus far, Communist China's efforts have cost little and have drawn on those resources in which China has a comparative advantage. However, China could not add on other kinds of support, such as large quantities of sophisticated weaponry, without endangering the delicate balance between total resources and rockbottom needs.

E. OUTLOOK FOR ECONOMIC POLICY

This assessment of economic policy and prospects for the next 5 years in Communist China rests on the two assumptions; namely, no major war involving China and no reapproachment with the U.S.S.R. The political changes that will be associated with any changes in Chairman Mao's status are subsumed under two alternative assump-

tions: (1) continuation of the low-key economic policies of 1961-65, or (2) introduction of another whirlwind leap forward (or a similarly disruptive ideological campaign) as an offshoot of the Proletarian Cultural Revolution.

The food-population problem will continue to be the first item on the agenda in any discussion of Communist China's intermediate-term economic prospects. The agricultural policy inherited from 1961-65 is one of steadily increasing inputs of fertilizer, equipment, and technology and of tolerating small plots, petty trade, and household handicraft production. This policy may be sufficient to feed adequately the growing population, given average weather and continued imports of grain, probably increasing slowly up to say 7 or 8 million tons annually. On the other hand, a new Leap Forward policy that (1) prohibited private agricultural and trading activity on ideological grounds, (2) switched technical leadership back from the old farmers to the ideologues in Peking, and (3) brought the communes back from limbo would lead to a food crisis much more quickly than did the original leap.

In this connection, one can argue that the present Chinese leadership when things are going well economically adopts political policies that are ruinous economically. Conversely, when things are going badly economically, the leadership takes a pragmatic attitude and temporarily suspends political impediments. This model of the leadership's behavior assumes that its political ideas are sometimes in opposition to China's basic economic well-being—a reasonable assumption. The model leads to middle-of-the-road economic predictions, for if economic affairs are going well, they are pulled back down by political drives, whereas, if economic affairs are going poorly, political impediments are removed and economic activity is pulled up toward the norm.

Another interpretation of the relation between economic and political policies is that the party faithful must periodically be stirred up to move on to the next station on the road to communism or else they settle down at an intermediate point; at the same time, the general population must be goaded into speeding up the work pace and foregoing increases in living standards through appeals to patriotism and national pride.

On the supply side of the food-population balance, then, prospects are for small increases in food production that would more or less match growth in population but with the probability of some rise in imports of grain. These increases would be cut short in the event the leadership went ahead with another Leap Forward or a similarly disruptive ideological convulsion. On demand side of the food-population balance, population is growing at about 2 to 2¼ percent annually. Over the period 1966-70, it is difficult to forecast a population policy that would appreciably lower this rate. After 1970 the population prospects fan out in a wide range of possibilities, mainly because of the dynamic technology of birth control. However, there are three elements to consider briefly before population is locked into any forecast:

- (1) A disastrous dip in the food supply, however caused, might bring on a situation equal to or worse than 1960-61 and could cause an appreciable change in demographic rates.

(2) The rapidly evolving techniques of birth control might be applied before 1970 by the government in an unexpectedly thorough and successful fashion.

(3) The government might apply its administrative muscle to prevent all males from marrying before age 30 and all females before age 25; even if there were no change in the number of children per marriage this policy would have a tremendous one-time short-run effect on the birth rate in addition to a tremendous permanent long-run effect on the birth rate. The short-run effect would be the loss in births during the transition from present ages of marriage to the older ages. The long-term effect would be the reduction in the annual rate of growth of population caused by the increased length of time between generations.

Before the current political turmoil in Communist China, one could say with some confidence that in 1966-70 both population and the food supply would increase in the neighborhood of 2 percent a year. Now, however, the Proletarian Cultural Revolution may foreshadow a period in which either the food supply or the population or both could be substantially affected.

Economic policy for 1966-70 almost certainly will include top priority for work on nuclear weapons and their means of delivery. It is noteworthy while the regime has specified that those scientists and technical personnel who have made contributions should be protected from the Revolution, numbers of them must have felt its impact. An attack upon intellectuals as a class—the main target of the Revolution—affects all educated people in China. It is highly probable that the morale and efficiency of hundreds of lesser scientists, managers, economists, and teachers has already suffered. Moreover, the day-to-day business of factories and offices has been disturbed by interminable meetings to indoctrinate people in the new Revolution; so far, the impact has been mainly in urban areas and, by inference, mainly on industry, foreign trade, and science and technology. There are numerous precedents during the previous Leap Forward for great waste of energy in indoctrination and great confusion from disturbing the status of technical specialists.

Again two alternative policies are possible. The more happy policy from industry's point of view would be a continued emphasis on quality and usefulness of output, continued assimilation of the technology of Japan and Western Europe, and continued willingness to be content with political lipservice from the scientists and managers. The less happy alternative would be a shift in the focus of the Proletarian Cultural Revolution to the realm of economic affairs, with intensive indoctrination of scientists and managers and a determined effort to keep out foreign technicians and even foreign machinery. A resumption of large-scale Soviet aid seems a highly unlikely development because the revolution includes the U.S.S.R. as a key foreign influence to be weeded out. In one colorful instance, the Red Guard teenagers are said to have renamed the Sino-Soviet Friendship Hospital in Peking (a Soviet-aid project) the "Anti-revisionist Hospital."

The industrial outlook for Communist China is less bright if economic policy is viewed as demanding either catching up with the industrial potential of Japan, West Germany, and Great Britain or

developing solely from China's own resources. The advances made by China in nuclear technology, petroleum refining, and electronics come at a time when technology throughout the world is advancing geometrically. To be 10 years behind today raises the prospect of being several generations behind in the 21st century. In a relative sense, therefore, China is falling behind in industrial technology. Both the rift with the U.S.S.R. and the periodic rooting out of capitalistic tendencies in the economy assume even greater importance as hindrances to China's industrial progress.

Economic policy in Communist China probably will continue to be subject to wide swings for as long as Mao and other leaders of the "Maoist persuasion" are in control of China. These swings in policy will be greater than the changes in economic activity, because policy is translated into action slowly and imperfectly. For example, there is foot dragging down the chain of command, especially when Peking's policy sacrifices economic well-being for ideological objectives or ignores local interests in favor of national interests. Consequently, there is more continuity and inertia in the conduct of actual economic affairs than a description of highlights in economic policy suggests. China will continue to be a potentially rich but backward and overcrowded nation in which progress will be made only in spotty fashion. Its Communist rulers will continue to face a formidable food-population problem as well as the problem of mastering increasingly complex industrial technology. The leaders seem determined to continue to score successes and to throw away the fruits of success.

VI. GENERAL POLICY TOWARD ALLOCATION OF RESOURCES

The treatment of economic policy in the preceding chapters has been chronological. The major swings between periods of rational economic policy and periods of near-disastrous irrational economic policy have been described. One general conclusion is that the economic history of Communist China (1949-66) is characterized by amazing economic successes which were almost carelessly cast aside in periods of political frenzy. A second conclusion which follows from the first is that the continuation of this pattern of violent swings between orthodox and radical policies bodes ill for future Chinese economic progress. The purpose of this last chapter is to pull together generalizations about the allocation of economic resources under the Chinese Communist regime, generalizations that were introduced but not always highlighted in the chronological treatment.

A. THE QUESTION OF "WHAT" IS TO BE PRODUCED

The Chinese Communist leadership has consistently backed the production of those goods that would turn China into a modern military and industrial power in the shortest period of time. "What" is to be produced is thus:

1. Only sufficient food, clothing, and other consumer goods to sustain the productive energies and morale of the population at a Spartan level.
2. Sufficient military goods to maintain a large infantry force, a large but obsolescent air arm, a small naval arm, and a growing nuclear capability.

3. As much investment as remaining resources would permit; this investment would encompass a large amount to support the building of arsenals and other military production facilities, a large amount for the expansion of the metallurgical and machinery industries, and a small amount to support the austere consumer objectives.

In all the Communist countries the consumer goods part of the "what" tends to be sacrificed, if necessary, to maintain planned rates of growth in the military and heavy industry sectors. At the same time, as these countries become more urbanized and industrialized, the minimum standards that the consumer will tolerate gradually rises. For Communist China the minimum viable food ration was not provided in the winter of 1960-61 and a quick change in allocation policy was necessary. In 1966 the frenzied campaign of the Red Guards against civilized consumption standards has reached the ridiculous stage of destruction of books and phonograph records and the impounding of bourgeois furniture and other household effects. The result is a tangible loss in the stock of consumer durables and a trenchant lesson to all persons not to anticipate the normal rise in living standards that accompanies industrialization. Whether this will be carried to the logical next step—the draconian equalization of housing, clothing, leisure, and all other standards of consumption—remains to be seen.

As between military and heavy industry goods, the Chinese Communist leadership has little room for choice, once the decision to go ahead in the nuclear field has been made. The concentration on nuclear development has preempted the small numbers of highly trained scientists and engineers at the expense of nonnuclear military production, general industrial production, and the teaching of the new generation of scientists and engineers. To the extent choice has been feasible in heavy industry in the post-Leap recovery period, there has been concentration on the expansion of the petroleum and chemical industries.

B. THE QUESTION OF "HOW" IT IS TO BE PRODUCED

The Chinese Communist leadership started out quite successfully, it has been argued in this paper, with the system of Soviet-style industrialization. The establishment of economic law and order raised China's production possibilities sharply and created the ability to produce enough goods domestically to pay for the 300 Soviet plants. The "how" of production originally was based on the principle of comparative advantage in the form of extensive Soviet assistance, together with rapid but orderly development of domestic Chinese resources. The Great Leap Forward changed the "how" of production for the worse. The pace of development of both the modern and primitive sectors of the economy was speeded up under the slogan of "walking on two legs." The Soviets picked up their blueprints and went home. Nonetheless, there still remained some choice between complete autarchy and partial reliance on the outside world, and in the period 1961-66, China has looked to Japan and Western Europe for a few key elements of industrialization. The Proletarian

Cultural Revolution, however, is rabidly xenophobic and could narrow down even this small amount of foreign industrial and technical support.

C. THE QUESTION OF "FOR WHOM" IT IS TO BE PRODUCED

The Chinese Communist leaders have minced no words about the primary objectives of their economic policy. The question of "for whom" has been settled in favor of the state as a whole and against the individual members of the state. Increases in consumption are made, if at all, only grudgingly. Differentials in pay and living standards are frowned on, that is, material incentives are supposed to be replaced by political motivation; the new Chinese Communist man is not to think of advancing himself materially but of participating in a soul-steeling revolution whose tense glories he will share continuously. This important aspect of "for whom" cannot be put into effect fully. In the recovery period of 1961-65, for instance, the leadership had to bow to the realities of the situation and allow benefits to the rank and file to be at least partially responsive to their productive efforts.

This type of policy toward the "for whom" question earned Khrushchev's jibe of "pantsless communism." In turn, the Chinese Communist leadership professes to scorn the "goulash communism" of the U.S.S.R. as part of the revisionist tendencies of Soviet policy. A curious vestige of former pre-Communist distribution patterns remains in the persons of thousands of former capitalists who have been paid annual interest on their shares in property taken over by the state. The more important of these capitalists live handsomely but discreetly. A second perhaps more important form of inequality in income distribution is the high incomes and perquisites of local party and Government bosses. These bosses are part of a political system of give-and-take, and the existence of local problems of graft and privilege is made clear through periodic purges of the more grasping (or less lucky) violators. A third form of income inequality is incomes accruing from abroad to repatriated Overseas Chinese. A fourth form of income inequality is the high pay and fringe benefits received by top-level scientists and engineers, particularly those trained in the West. Most Communist regimes seem to be forced to tolerate a few apolitical persons in order to keep scientific and military research going. All four of these kinds of inequality in income almost certainly will be reduced if the current Proletarian Cultural Revolution is allowed to run its course. In fact, one aspect of the Red Guards' actions in stripping bourgeois homes is said to be the resentment of the multitudes of poor against these relatively rich families.

In addition to these special high incomes, an important element in assessing the question of "for whom" is the considerable income differentials among rank-and-file families. In the countryside, for example, the fortunes of weather, prices, policies toward private plots, and severities of requisitions varies in the extreme. Some local leaders are said to have protected their local people by secretly retaining large amounts of an extra good harvest. In the cities, differences in the number of workers and their jobs lead to wide

differences in family income; stakhanovite workers, for instance, have large fringe benefits. Here again, the Proletarian Cultural Revolution may be expected to lead to a curtailment of these differentials. In contrast, periods of more orderly and rational economic policy are marked by a natural increase in these differentials as a means of rewarding skill and productive effort.

THE TEMPO OF ECONOMIC DEVELOPMENT
OF THE CHINESE MAINLAND, 1949-65

BY

TA-CHUNG LIU

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THE TEMPO OF ECONOMIC DEVELOPMENT OF THE CHINESE MAINLAND, 1949-65

SUMMARY¹

The tempo of economic development on the Chinese Mainland will be analyzed in this paper in terms of the national product² and related statistics. While the national output is the best available indicator of the total productivity of an economy, it must be emphasized immediately that it is quite inadequate as a measure of human welfare, especially in a totalitarian state where expansion in heavy industrial output is often achieved through rigid regimentation and coercive measures. Moreover, the productive capacity of the economy as a whole does not reveal the strength of the nation in carrying out a specific endeavor to which a large concentration of resources is devoted. Thus, the per capita product of the Chinese Mainland is low by any estimate and on any standard, but a nuclear and missile program produced successful results in recent years when the economy as a whole was still experiencing difficulties. One must not be misled by the low per capita productivity on the Chinese Mainland to a feeling of complacency regarding her technical capabilities in certain narrowly defined spheres. At the same time, it is equally erroneous to consider the achievement in a specialized field as an indicator of the degree of development of the economy as a whole. All these inadequacies notwithstanding, an analysis of the movement in its national product is a necessary and important part in any attempt to understand the working of the Communist economy on the Chinese Mainland.

The performance of the Chinese Communist economy during the First Five-Year Plan period will be described in terms of both an estimate of the national product reconstructed from the Communist statistics themselves without adjustment and an independent estimate by Liu and Yeh which incorporates some adjustments for the reliability of the Communist data. The relative plausibility of the two estimates will be discussed. For the years after the Great Leap Forward in 1958, an exploratory estimate by the present author will be presented, together with a crude reconstruction of the Communist estimate.

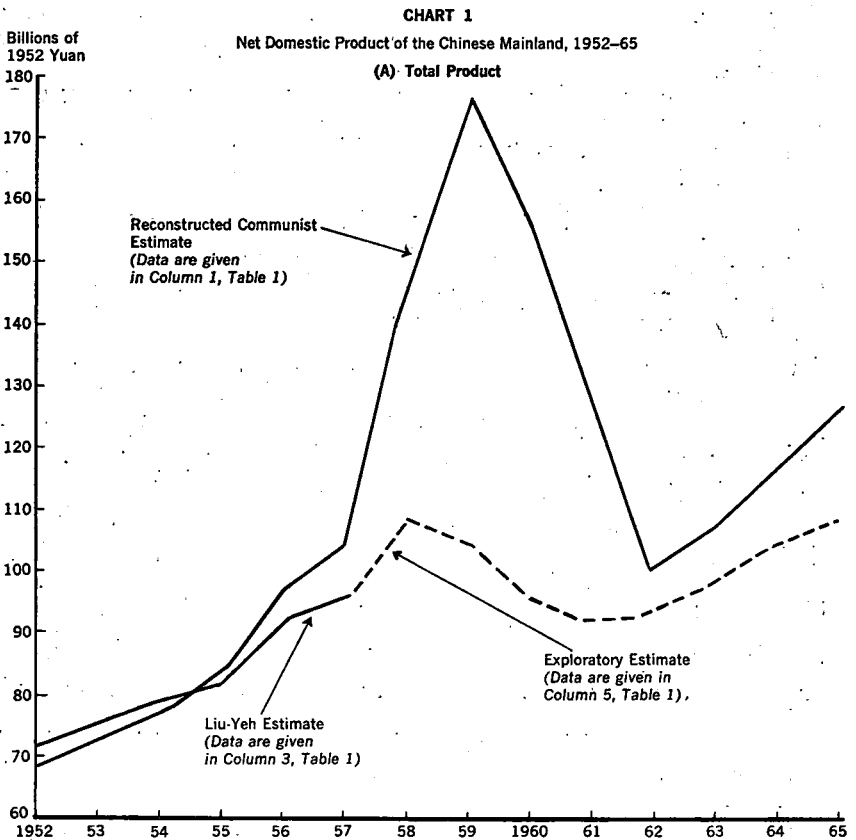
The People's Political Consultative Conference, held in Peiping in October 1949, can be considered as the commencement of the Com-

¹ This paper draws heavily on two previous contributions by the present author: (1) *The Economy of the Chinese Mainland: National Income and Economic Development, 1953-1959*, the Princeton University Press, 1965 (with K. C. Yeh); and (2) "Quantitative Trends in the Economy of the Chinese Mainland, 1952-1965," to appear in *Economic Trends in Communist China*, edited by Walter Galenson, Alexander Eckstein, and Ta-Chung Liu, The Aldine Publishing Company, 1967. The sponsorship of these two studies respectively by the RAND Corporation and the Committee on the Economy of China of the Social Science Research Council is gratefully acknowledged. For more detailed data, computation, and analysis the reader is referred to these two publications.

² Because of the limitation of the basic data, the gross and net domestic product, instead of the national product, is used in the analysis. The domestic product is also referred to as the total product (in contrast to per capita product) in this paper.

munist Regime on the Mainland. The rehabilitation of the economy from the devastation of the Sino-Japanese War and the ensuing internal conflict was fairly rapid. By 1952, the reconstructed Communist estimate of the net domestic product reached 68.6 billion yuan,³ 15 percent higher than the 1933 level of 59.5 billion (1952) yuan; and the per capita product in 1952 (121 yuan) was slightly higher than in 1933 (119 yuan). On the basis of the Liu-Yeh estimate for 1952, the net domestic product (71.4 billion yuan) and the per capita output (126 yuan) were respectively 20 and 6 percent higher than in 1933.⁴ (See section II.)

The period from the completion of the rehabilitation of the economy in 1952 to the most recent year 1965 is of the greatest interest. The different estimates of the domestic product and per capita output are given in chart 1 and table 1.



³ For well-known reasons, the use of the 1952 exchange rate of 1 U.S. \$=2.343 yuan to obtain estimates of total and per capita product in U.S. dollars will give misleading results.

⁴ The reconstructed Communist estimate of the domestic product for 1952 is likely to be an underestimate. On account of this underestimation, the rate of growth during 1952-57 is overstated by the reconstructed Communist estimate. (See section III.)

(B) Per Capita Product

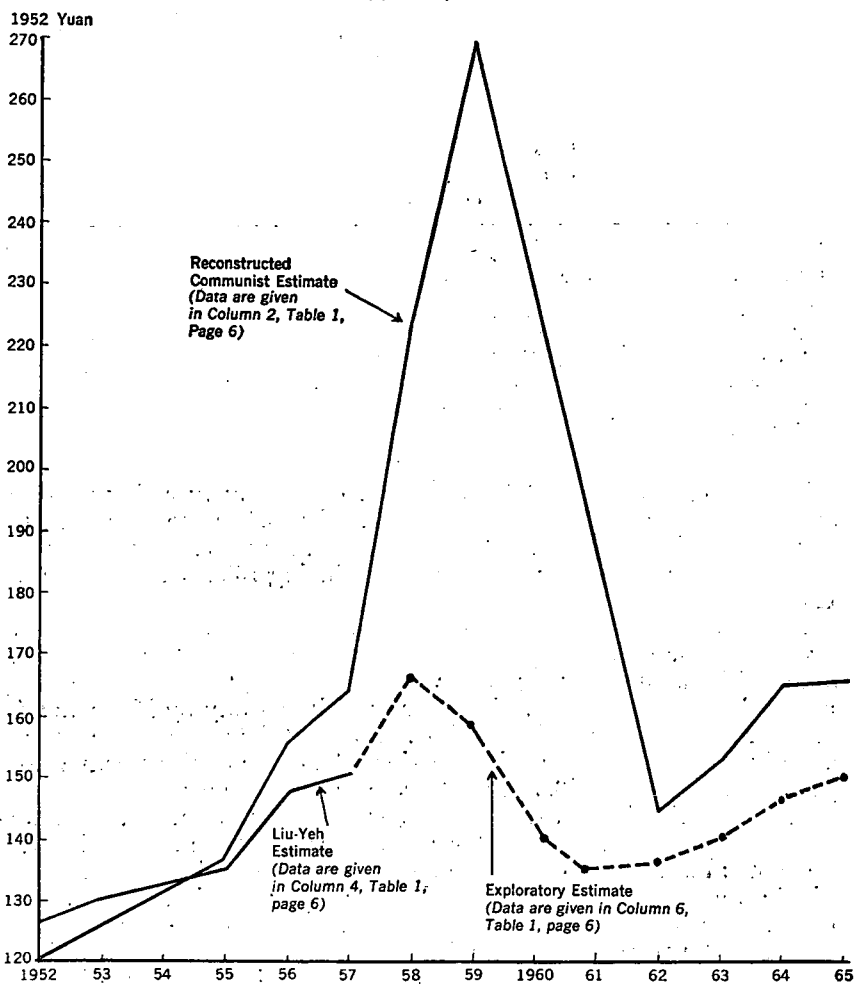


TABLE 1.—*Net domestic product of the Chinese mainland, total and per capita, 1952-65*[Total product in billions of 1952 yuan.¹ Per capita product in 1952 yuan]

Year	Reconstructed Communist estimate		Liu-Yeh estimate		Exploratory estimate	
	Total ² (1)	Per capita ² (2)	Total (3)	Per capita (4)	Total ² (5)	Per capita ² (6)
1952.....	68.6	121	71.4	126		
1953.....	73.3	126	75.3	130		
1954.....	77.8	131	79.3	133		
1955.....	83.3	137	82.3	135		
1956.....	96.4	155	92.1	148		
1957.....	104.2	164	95.3	150		
1958.....	145.0	222			108.0	166
1959.....	176.8	267			104.4	158
1960.....	155.9	232			95.9	143
1961.....	127.5	187			92.2	135
1962.....	99.5	144			94.0	136
1963.....	107.4	153			98.1	140
1964.....	117.3	165			104.2	146
1965.....	126.2	175			108.1	150

¹ For well-known reasons, the use of the 1952 exchange rate of 1 U.S. dollar equals 2.343 yuan to obtain estimates of total and per capita product in U.S. dollars will give misleading results.

² The figures given for 1958-65 are very crude estimates.

Sources:

Cols. 1 and 3: For the figures given for 1952-59, see Liu, T. C. and Yeh, K. C., *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-59*, Princeton University Press, 1965, pp. 213, 660, and 666. For the 1960-65 estimates, see sec. IV, 2 of this paper.

Cols. 2, 4 and 6: The population data used in obtaining the per capita estimates for 1952-58 are the Communist official data given in Liu and Yeh, *ibid.*, p. 102. For the population data used for the years after 1958, see sec. IV, 2 of this paper.

Col. 5: Liu, T. C., "Quantitative Trends in the Economy of the Chinese Mainland, 1952-65," in Galenson, W., Eckstein, A., and Liu, T. C., editors, *Economic Trends of Communist China*, Aldine Publishing Co., 1967, table 24.

The estimates for 1952-57 are based on relatively elaborate data, and will be analyzed in greater detail. On either the reconstructed Communist data or the Liu-Yeh estimate, there was steady growth in both the total and the per capita product during 1952-57. (See section III.)

According to the reconstructed Communist estimate, the rate of growth of the domestic product during 1952-57 was higher in Communist China (9 percent gross or 8.8 percent net)⁵ than in practically all of the more than 40 nations analyzed in a study by Kuznets⁶ for more or less the same period of time. Relevant data for a few countries are given in table 2 as an illustration. The per capita product also grew at a faster rate (6.6 percent gross or 6.5 percent net) than all the nations examined in Kuznets' study, except West Germany. Employment expanded at a much faster rate (4 percent) than population (2.3 percent); but because of the large number of unemployed in existence (including disguised),⁷ this relative change would have been a pure blessing for quite some time to come. The growth rate of per worker product (4.9 percent gross or 4.7 percent net) was also exceedingly high. The proportion of total product invested (24.4 percent), while equaled or bettered by many industrial nations both in long periods and in roughly comparable postwar years, was considerably higher than countries with equally low per capita product or with similar under-

⁵ All the statistical information quoted in this and the following three paragraphs can be found in table 6 of this paper.

⁶ Kuznets, S., "A Comparative Appraisal," in Bergson, A. and Kuznets, S., editors, *Economic Trends in the Soviet Union*, Cambridge, 1963.

⁷ See Liu, T. C. and Yeh, K. C., *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-59*, Princeton, 1965, pp. 101-105.

developed industrial structure. Yet, in spite of the high rate of savings, consumption expanded at 5.2 percent per year on a per capita basis and shared almost equally with other expenditures in the increase in total expenditure. The various incremental capital output ratios are low, substantially smaller than those of the U.S.S.R. and most other nations, industrialized or not. On the basis of the 1952 yuan, an incremental capital output ratio of 2.7, coupled with a capital formation proportion of 24.4 percent, resulted in an overall rate of growth of the gross product of 9 percent per year.⁸ The rates of increase of labor and capital inputs, separate or combined, were high; but so was the growth rate of productivity⁹ 3.9 percent per year. As shown in table 2, the growth rate of productivity is higher than any other nation during roughly comparable postwar years.

TABLE 2.—Average annual rates of growth in total¹ and per capita product and in "productivity" for selected nations: Communist China, 1952-57; other nations, 1950-58

[In percent]

	Total product	Per capita product	"Productivity" ²
Communist China, 1952-57:			
Reconstructed Communist estimate	9.0-8.8	6.6-6.5	3.9
Liu-Yeh estimate	6.2-6.0	3.9-3.6	2.9
Burma	6.3	5.1	-----
France	4.3	3.4	3.3
Italy	5.6	5.0	-----
Japan	8.0	6.6	3.1
Philippines	5.7	3.3	-----
Republic of China (Taiwan)	8.8	5.4	-----
South Korea	2.5	1.3	-----
Thailand .....	.7	-1.2	-----
Turkey	6.9	4.0	-----
United Kingdom	2.2	1.9	.7
United States	2.9	1.1	1.0
U.S.S.R.	7.2	5.4	2.5
West Germany	8.0	6.8	3.8

¹ For the various versions of the total product (gross or net, national or domestic) presented in this table for the different nations, see the study by Kuznets cited below.

² For the meaning of "productivity", see footnote 2, p. 10. The weights of labor and capital in the combined factor input are respectively 7 and 3. See the study by Kuznets cited below, table VIII.14.

Sources:

Communist China: Table 6 of this paper.

All other nations: Kuznets, S., "A Comparative Appraisal," in Bergson, A. and Kuznets, S., editors, *Economic Trends in the Soviet*, Cambridge, 1963, tables VIII. 2, VIII. 4, and VIII. 14. (For the U.S.S.R., the data on total and per capita product are those for GNP computed on 1937 factor cost, given in table VIII. 2 of Kuznets' study.)

The performance of the Communist economy during 1952-57, as represented by the reconstructed Communist data, must be considered a most outstanding success, exceeding those of West Germany and Japan. It approaches a miracle if one considers the very limited technical knowledge and personnel the Communist regime had to start with, the practical nonexistence of uncultivated land, the gradual disappearance of private incentives to the peasants, the severe tightening of control of economic activities by cadres lacking training in such spheres, and the rather short period of time in which to condition the people and the economy to the rather unfamiliar modern industrial organization and operation.

Strong reservations must be made on the credibility of such a picture. Indeed, one would seriously question why the Communist

⁸ The rate of growth of the product can be computed by dividing the capital formation proportion by the incremental capital outlay ratio.

⁹ The growth rate of "productivity" may be roughly defined as that of the total product in excess of the growth rate of the combined labor and capital input.

leadership, however ambitious they may have been, would have been so anxious to institute as radical a change in their economic policies as the Great Leap Forward in 1958 if everything was indeed making such great progress, unprecedented not only in China but also in the entire world.

The growth history represented by the Liu-Yeh estimate seems more in accordance with reality. The overall growth rate (6.2 percent gross or 6.0 percent net) is by no means low; in fact, it was higher than roughly two-thirds of the nations compared in the study by Kuznets referred to earlier. But population was expanding much faster (2.3 percent) than employment (1.5 percent). The rate of investment (23.8 percent at 1952 prices), while high, was not sufficient to absorb the fast-growing population into employment. Per capita consumption was rising at a much more modest rate (1.9 percent, excluding communal services) than that indicated by the reconstructed Communist estimate (5.2 percent); but the prewar 1933 level had not been regained even at the end of this period (1957). The capital output ratios were reasonably low. But an incremental capital output ratio of 3.9, coupled with an investment proportion of 23.8 percent, yielded a growth rate of the gross product of 6.2 percent per year which, while quite high, failed to bring about an increase in employment and consumption satisfactory to the regime. Even the picture represented by the Lin-Yeh estimate for 1952-57 was very good; but to a leadership having extraordinary ambitions, both domestic and international, and an unusual confidence in their ability to put through radical reorganizations of the economy, a prospect of growth on the pattern during 1952-57 might have been considered unsatisfactory. A radically different program, which hopefully would utilize the increasingly underemployed human resources to the fullest extent without having to divert capital resources from the large-scale modern projects, would have appeared attractive to the Communist leadership. In the light of the Lin-Yeh estimate, the motivation underlying the Great Leap Forward (1958-59) seems more understandable.

The Great Leap Forward was based on a sound diagnosis of the basic weakness of the Mainland economy but a serious misconception of the proper way to deal with it. There was a tremendous amount of surplus labor and a serious shortage of capital and of highly trained manpower as late as in 1957, in spite of the significant degree of industrialization achieved during 1952-57. Communes were organized in 1958. Life in the villages was almost completely regimented. Peasants were marched to the field to work impossibly long hours, and terrific pressure was imposed on industrial enterprises to expand production at unprecedented paces. The output of almost everything was to double in a single year from 1957 to 1958. (See section IV.)

Since the reconstructed Communist estimate of the domestic product for 1958-65 is very unreliable (see section IV, 1 and 2), the exploratory estimate in table 1 will be the basis of the summary discussion. Under the initial stimulus of the Leap, there was perhaps a 13-percent increase in the total product from 95.3 billion (1952) yuan in 1957 to 108 billion in 1958. But the excessive regimentation in the communes, the denial of work incentives through the abolition of private plots and the change to equalitarian distribution systems for the peasants, the total miscalculation of technical possibilities in introducing the backyard furnaces and unworkable agricultural techniques

(for example, deep plowing, close planting, and the poorly designed irrigation and flood control systems), and the exhausting pace imposed on the population, together with bad weather conditions, brought disaster to agriculture. Farm output declined sharply from 1958 to 1960. The supply of agricultural raw materials to the industrial sectors diminished severely. The whole economy suffered a serious leap backward from 1958 to 1961. The domestic product in 1961 (92.2 billion 1952 yuan) was 15 percent lower than the 1958 peak (108 billion). The per capita product dropped perhaps 19 percent from 1958 to 1961, roughly back to the 1955 level.¹⁰

As the agricultural crises deepened and industrial production slackened, the Communist regime relaxed the worst features of the Leap (e.g., the abolition of such unworkable schemes as the Commune mess halls and the "miracle techniques of cultivation," and the limited restoration of private plots and incentive payment schemes) and sharply cut back the investment program. The economy began to recover in 1962. The total product in 1965 probably has regained the 1958 amount, with the per capita product perhaps back to the 1957 level. A total of 7 years, however, has been lost without any growth during a period (1958-65) when practically all other nations experienced a significant measure of growth and development.

For the period 1952-65 as a whole, the relatively impressive record of development during the earlier years 1952-57 was marred by the poor performance during 1958-65 following the Great Leap Forward. The average annual rates of growth of total and per capita product during 1952-65 amounted to 3.3 and 1.4 percent respectively. Following the considerable achievement during roughly the First Five-Year Plan period 1952-57, the Communist regime pursued a "big push" policy which resulted in a cycle of peak and trough, with practically no growth from 1958 to 1965. Moreover, the agriculture base in 1965, still somewhat smaller than in 1957 and very substantially below that in 1958, would hardly be sufficient to support a sustained growth. Neither will the current political unrest on the Mainland be conducive to an orderly development of the Chinese Communist economy in the foreseeable future.

I. INTRODUCTION

The development of the Communist economy on the Chinese Mainland can best be summarized by the movement of the total and per capita national product since 1949. The national product encompasses the results of all economic activities conventionally defined as contributing to the total annual output available for consumption and investment. If reasonably full employment of human and other resources prevails, it also indicates the national capacity to produce.

Several important reservations must be made immediately. First, the total capacity to produce should not be confused with the capability to achieve a specific aim. The national product of a nation may be small on a per capita basis. Nevertheless, success in a certain endeavor is possible if sufficient resources are concentrated on it. In a totalitarian state, the authority is free to devote a disproportionately large amount of resources to purposes which contribute neither to

¹⁰ The estimate of per capita product for 1958-65 is crude, and can indicate only the rough order of magnitude.

the material well-being of the people or the productive capacity of the economy. Even though a country may not yet have gained the knowledge and the experience required for an efficient development of its economy as a whole, the best talents at its disposal can be directed toward a specific project. Thus, the Chinese Mainland has been successfully developing a nuclear and missile program during a period when the economy has barely recovered from the setback suffered during the Great Leap.

Second, the national product, as computed on the conventional framework, is inadequate as an indicator of human welfare, especially in the case of the Chinese Communist economy. There have been many radical changes in the social and political environment on the Chinese Mainland. While a degree of loosening sometimes followed a severe tightening of control, there has been a reduction of personal liberty for all classes of people including the peasants throughout the period under study. The adverse affects on human welfare of the Communist effort at regimentation found no expression in the national product. Nor are all the costs incurred in producing monetary and imputed incomes recognized in national income accounting. This is especially true during the Great Leap Forward years 1958-59. For instance, we have no way of estimating the proper depreciation charges for the resources wasted in constructing the backyard furnaces, let alone the deterioration of the health of the people and of the quality of land which must have followed the hardship and abuses inflicted upon them during the Great Leap. A proper evaluation of the tempo of development must supplement the purely economic analysis presented in this paper with sociological and political studies, a task beyond the competence of an economist.

Third, the basic Communist data are inadequate and inaccurate. For this reason, several independent estimates of national product have been made by scholars in the United States, especially for 1952 and the First Five-Year Plan period 1953-57. These estimates differ significantly. The analysis of the economic tempo during this period will be analyzed in terms of two estimates, one constructed on Communist data themselves and another which embodies corrections in the Communist data for reliability. The findings will thus vary within a range which reflects different degrees of trust of the Communist data.

The Communist data deteriorated in quality precipitantly during 1958-60; and they practically vanished since 1961. Only an exploratory estimate of the movement since 1958 can be attempted. There are reasons to believe, however, that this estimate represents a reasonable approximation to the main trend in the economy during these years. A crude reconstruction of the Communist estimate of the domestic product for 1958-65 will also be presented.

Our analysis of the tempo of economic development on the Chinese Mainland will deal with the following three periods separately: the rehabilitation period (1949-52); the period of relatively steady growth (1952-57); and the Great Leap Forward and its aftermath (1958-65).

II. THE PERIOD OF REHABILITATION, 1949-52

The initial effort of the regime to rehabilitate the economy was fairly successful for three main reasons. First, by the end of 1949, large-scale military operations had practically ended. For the first

time in 12 years there was no fighting on the Chinese Mainland. This alone was a boon to the whole country for it made possible the resumption of normal economic activities. Second, the successful Communist price stabilization program in 1950 curtailed the inflation which had run uninterrupted from the last years of the Sino-Japanese War, and greatly assisted in rehabilitating the economy. Victory bonds were issued and, quite understandably, private businesses and individuals had to come forward to subscribe to them. Vigorous efforts were made to increase Government revenue (for example, to impose taxes in real terms so that tax revenue would increase with the price level.) Except for a small surtax on agriculture, taxes were now collected entirely by the Central Government, and stringent controls were reestablished over the receipts and expenditure of all Government organs and state enterprises. These measures were undoubtedly effective in controlling and reducing inflationary pressure. Probably most important to the price stabilization program, however, was the regime's success in ending the flight from cash into commodities. Such transactions were limited, and people did not engage in them because they were afraid of the newly established revolutionary regime. Third, and very important, the mildness of the 1949 "Common Program," to be carried out by Communists and non-Communists alike, succeeded in relieving the urban population's feelings of anxiety and uncertainty toward the Communist regime.

There is no question that, as the economy recovered from the devastation of 12 years of war, production in all fields increased greatly from 1949 to 1952. The statistics during the period of rehabilitation, however, are very unreliable for the simple reason that the Communists did not have an effective national statistical reporting system of their own until the establishment of the State Statistical Bureau on August 8, 1952. The rate of growth of national income and the gross value of output of industry and agriculture, given in table 3, are the official Communist data. It is impossible to say how much of the 70-percent increase in national income from 1949 to 1952 represented genuine recovery and how much was merely a reflection of the gradual improvement in statistical coverage during this period. It is, however, possible to compare the economy in 1952 with a relative normal prewar year 1933. As the data in table 4 show, the total and per capita products in 1952 exceeded those in 1933, indicating that, by 1952, the economy had completed the phase of rehabilitation.

TABLE 3.—*Communist data on national income and production during the period of rehabilitation, 1949-52*

	National income (Index numbers: 1949=100)	Combined gross output value of industry and agriculture (billions of 1952 yuan)
1949.....	100.0	46.6
1950.....	118.6	57.5
1951.....	138.8	68.3
1952.....	169.7	82.7

Source: The State Statistical Bureau, *Ten Great Years*, Foreign Language Press, Peiping, 1960, pp. 16 and 20.

TABLE 4.—Total and per capita product, 1953 and 1952

	Net domestic product (billions of 1952 yuan)		Per capita product (1952 yuan)	
	Reconstructed Communist estimate	Liu-Yeh estimate	Reconstructed Communist estimate	Liu-Yeh estimate
	(1)	(2)	(3)	(4)
1933.....		59.5		119 ^a
1952.....	68.6	71.4	121	126 ^b

Sources:

1933: Computed from data in Liu and Yeh, *The Economy of the Chinese Mainland, op. cit.*, p. 66.
1952: Table I.

III. THE PERIOD OF RELATIVELY STEADY GROWTH, 1952-57

For the period 1952-57, relatively good economic statistics became available in increasing volume. This period roughly coincides with the First Five-Year Plan period 1953-57. Since recovery from war damage had been completed by 1952, it becomes possible to evaluate a large portion of the Communist data for this period on the basis of what little is known about the normal productivity of agriculture in China. Because of the relatively abundant Communist data, several scholars in the United States have made independent estimates of national product for this period.

1. AVAILABLE ESTIMATES OF NATIONAL PRODUCT

The different estimates of national product for 1952 and 1957, expressed in constant 1952 yuan, are presented in table 5, together with the estimated average annual rates of growth.

TABLE 5.—National product estimates of the Chinese Mainland, 1952-57

[In billions of 1952 yuan]

	Communist (net material product)	Eckstein (gross national product)	Hollister (gross national product)	Li (net national product, reconstructed Communist estimate)	Liu-Yeh (net domestic product)		Wu (net national product)
					Reconstructed Communist estimate	Author's own	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1952.....	61.1	71.3	67.9	72.9	68.6	71.4	72.4
1957.....	93.5		102.4	111.8	104.2	95.3	94.8:
Average annual growth rate.....	9.0		8.6	8.8	8.8	6.0	5.6.

Sources:

Col. 1: Liu and Yeh, *The Economy of the Chinese Mainland, op. cit.* p. 220.
Col. 2: Eckstein, A., *The National Income of Communist China*, Glencoe, 1961, p. 56.
Col. 3: Hollister, W. W., *China's Gross National Product and Social Accounts, 1950-57*, Glencoe, 1958, p. 2.
Col. 4: Li, C. M., *Economic Development of Communist China*, Berkeley and Los Angeles, 1959, p. 106.
Col. 5: Liu and Yeh, *ibid.*, p. 213. This estimate was reconstructed from basic Communist data without corrections for reliability but was computed on standard Western concept of net domestic product.
Col. 6: Liu and Yeh, *ibid.*, p. 66.
Col. 7: Wu, Y. L., Hoerber, F. P., and Rockwell, M. M., *The Economic Potential of Communist China*, Menlo Park, 1964, p. 241.

While discrepancies exist among the different estimates for 1952, the reasons for the differences are now reasonably clear.¹¹ The main difference between the Communist estimate of the net *material* product, 61.1 billion yuan (col. 1), and the Liu-Yeh reconstructed estimate of net domestic product, 68.6 billion yuan (col. 5), lies mainly in the omission, from the former, of the contribution of the service sectors on the well-known Communist convention of estimating national income. Eckstein's estimate of the gross national product, 71.3 billion yuan (col. 2), and the Liu-Yeh estimate of the net domestic product, 71.4 billion yuan (col. 6), can be almost completely reconciled. Hollister's and Li's estimates will be discussed presently in connection with the discussion of the rate of growth below. Wu's estimate is essentially the same as the Liu-Yeh estimate. One may put the net domestic product for 1952 at around 71 billion yuan without running a serious risk of misrepresenting the actual level of total product.

Of more importance than the absolute magnitude of the national product in 1952 are the differences in the growth rates implied in the different estimates during 1952-57.

According to the Communist estimate (col. 1, table 5) and in terms of the constant 1952 yuan, the average annual rate of growth of the net material product during 1952-57 is 9 percent per year. In all likelihood, it is an overestimate of the overall growth rate of the economy for several reasons.

First and most important, there is general agreement among scholars in this country that the Communist data on agricultural production during the early years in this period underestimated the actual output so that the rate of growth of this sector was overstated for the period as a whole.¹²

The second source of upward bias in the growth rate lies in the way the value of industrial production was computed by the Communists. The 1952 (third quarter) prices were used as weights in computing the official gross values of production for years prior to 1957. Consumer goods prices were depressed in the fall of 1952 due to the "Five Anti" campaign against private enterprises, but prices of producer goods were little affected. Thus, producer goods were overvalued relative to consumer goods. Since producer goods increased faster than consumer goods after 1952, the official rates of growth of industrial production were therefore upward biased. The valuation of new products at trial-manufacturing expenses, the so-called new product effect, also exaggerated the increasing trend. In addition, as will be shown later, there are indications of exaggeration in the reported increase in consumer goods production.

Another important source of upward bias is the omission, from the estimate of employment, of workers in many traditional, small and scattered producing units in the handicraft, trade, and transportation sectors.¹³ Since the output of these workers hardly increased, if not actually declined, during 1952-57, the omission would result in an exaggerated overall rate of growth.

¹¹ For a detailed analysis of the differences between the estimates, see Liu, "Quantitative Trends in the Economy of the Chinese Mainland, 1952-65," *op. cit.*, section II.

¹² See the following pages in the references cited in table 5: Eckstein, p. 32; Hollister, pp. 19 and 29; Li, p. 63; Liu and Yeh, pp. 43-46; and Wu, p. 185.

¹³ See Emerson, J. P., *Nonagricultural Employment in Mainland China: 1949-1958*, Bureau of the Census, Washington, D.C., 1965, p. 69.

Fourth, there are admissions by the Communists themselves that local units deliberately falsified reports and overstated output in order to fulfill and overfulfill quotas.¹⁵ It is reasonable to assume that the pressure to expand output intensified during 1952-57, and hence attempts to falsify reports may also have increased.

Finally, the concept of "net material product" excludes from it many so-called nonproductive sectors which expanded apparently less rapidly than those included in it. This is reflected in the difference between the Communist estimate of a 9-percent rate of growth and the 8.8 percent computed from the estimate (col. 5, table 5) reconstructed by Liu and Yeh on Communist data without correction for reliability but on the standard Western concept of domestic product which includes incomes originating in the nonproductive sectors.

The reconstructed Communist estimates by Li (col. 4) and Liu and Yeh (col. 5) naturally yield a rate of growth, 8.8 percent per year, almost as high as the Communist estimate. The Hollister estimate (col. 3), 8.6 percent per year, is not free of the sources of the upward bias in the Communist estimate discussed above, except the last one.

Attempts to correct the apparent defects in the Communist statistics on food crops and consumer goods and to supplement the deficient Communist data on the traditional and small enterprises were made in deriving the Liu-Yeh estimate given in column 6 of table 5 (reproduced more fully in col. 3 of table 1).

That the Communist figures on the production of food crops for the early years during 1952-57 are underestimates of the actual output is no longer a question.¹⁶ The difficult problem is to correct this bias. The procedure followed by Liu and Yeh is briefly outlined here.

First, the Communist figure of the per capita consumption of food crops in 1957 was accepted as roughly correct. It is unlikely that the Communist figure for 1957 is a clearcut underestimate of the actual output, because the per capita consumption figure implied for that year is as much as 14 percent higher than the estimated average ration allowed by the Communist regime. It is reasonable to assume that the Communists, knowing that rationing and control regulations could not be completely enforced, would fix the ration at a lower level than the actual amount of consumption. But the Communist rationing and control systems were probably effective enough for actual consumption not to have been more than 10 to 15 percent higher than the ration amounts allowed.¹⁷ On the other hand, it is also unlikely that the 1957 per capita figure overestimates the actual output. For the calorie intake implied in the 1957 per capita figure is 5 or 6 percent lower than the estimated 1933 level, and there is no evidence that the per capita food consumption level in 1957 was much smaller than in 1933.

Second, the per capita consumption of food crops during 1952-56 must be estimated. This is an exceedingly difficult task; at the very best, we can give no more than an educated guess. There is no reason to assume that per capita consumption of food crops had been increasing during 1952-57. In fact, the control of food consumption had

¹⁵ See, for instance, *People's Daily*, Sept. 12, 1953.

¹⁶ See footnote 12, p. 57.

¹⁷ See Liu and Yeh, *The Economy of the Chinese Mainland*, op. cit., pp. 47-51.

been gradually tightened throughout the period, and this would have been unlikely had there been increases in per capita supply of food crops. On the other hand, there is no evidence that per capita consumption was reduced during this period. It seems that the only reasonable assumption one can make is that it was more or less constant throughout 1952-57.

This assumption enabled us to estimate the production of food crops for all the years 1952-57. Crops were increasingly used for food, and Communist data are available on the annual percentage used for food in total food crop production, including quantities exported. If we assume that the importation of food crops during this period had been negligible and that there had been no change in the amount in storage, the output can be easily computed for 1952-57 on the basis of the population data. The increase in total production therefore reflects mainly the growth of population, modified only by the increasing percentage of crops used for food.¹⁸

Another adjustment was made in the Communist figure of hog production in 1957. It was reported by the Communists that the number of hogs increased by as much as 47 percent during 1957, a claim which is not only improbable, but was contradicted by a number of events.¹⁹ First, there is no evidence of increases in either exports or domestic consumption of pork subsequent to 1957. Second, animal feeds actually reduced from 1956 to 1957. For the lack of a better alternative, it seems reasonable to assume a percentage increase in the number of hogs equal to the rate of growth of population in 1957.

While it is clear that the particular price weights used, the "new product effect," and the tendency to exaggerate performance all point to an upward bias in the Communist data on the output of producer goods, no adjustments were made in the Liu-Yeh estimate for the lack of a reasonable procedure to do so. There is, however, a reported increase of 200 percent in the production of a group of unidentified consumer goods from 1952 to 1957, much higher than the 45-percent increase of the output of identified and essential consumer goods during the same period.²⁰ The latter increase is already fast, reflecting, as it did, not only the increase in actual consumption but to an unknown extent also a shift from handicraft output and consumption goods processed at home to modern factory production. Such a fast rate of increase (200 percent over 5 years) of consumer goods of unknown identity, at a time when the rate of investment was not only high but also increasing rapidly, cannot be accepted at face value without further scrutiny. An effort must be made to examine what commodities they could have been.

From 1952 to 1956 the Communists published some aggregate data on daily consumption items including china and earthenware; consumers' metal products; leather and fur products; glass products;

¹⁸ A number of possible criticisms of this procedure have been discussed and answered in Liu and Yeh, *ibid.*, pp. 53-54. They include such questions as whether the recovery from war damages could have been largely completed by 1952; whether the effects of increasing use of fertilizers and mechanized implements and of the completion of certain irrigation and flood control projects have been taken into consideration; and whether the rationing controls were not imposed to prevent higher consumption of food crops in response to higher income, implying that per capita consumption of food crops may have been increasing during 1952-57.

¹⁹ See Liu and Yeh, *ibid.*, pp. 54-55.

²⁰ See Liu and Yeh, *ibid.*, p. 60.

furniture; soaps and cosmetics products; cultural, educational, and "technical" products; and an unnamed "others" category which varied in size from one-fifth to one-third of the total. The gross value of output of this aggregate group of consumers' goods increased 44 percent from 3.7 billion yuan in 1952 to 5.3 billion yuan in 1956. This is about equal to the rate of increase of the identified portion of the total value of consumer goods, but it is a great deal less than the 200 percent increase reported for the unidentified portion from 1952 to 1956. This information fails to support the claim made for the rate of increase of the global total of the output of consumer goods. At the risk of duplicating some of the items already covered in the daily consumption items mentioned above, we have put together some fragmentary data on such "luxuries" as fountain pens, radios, clocks, hot water bottles, pencils, bicycles, and antibiotics. The total value of these goods (in 1952 yuan) cannot exceed about 1.1 billion in 1957, but there was a total value of 9.6 billion yuan worth of unidentified consumer goods (again in 1952 yuan). However fast the rate of increase of these "luxury" items may have been, their increased production could not possibly explain a 200 percent increase from 1952 to 1957 of the unidentified portion of the gross value of consumer goods to a total of 9.6 billion (1952) yuan.

The 200 percent increase in the unidentified portion of consumer goods from 1952 to 1957 is therefore inexplicable. Actually, even an increase of 45 percent in the identified portion of consumer goods from 1952 to 1957 is probably too high in view of the fact that resources are increasingly channeled to investment. The nature of the identified consumer goods is largely known, and we have no reasonable basis on which to make an adjustment in the data; but there can be no doubt that the rapid rate of increase reported for the unidentified portion is exaggerated. To use the Communist data on the value of production of consumer goods without adjustment would result in an overestimate of the rate of growth of the national product. We have recomputed the total annual value of consumer goods production from 1953 to 1957 by assuming that the unidentified portion increased at a rate equal to that of the identified portion. If that assumption is wrong, it overstates the increase in unidentified goods and our estimate errs in the upward direction.

The Jiu-Yeh estimate given in column 3 of table 1 was derived after adjustments were made in Communist data on agricultural output and consumer goods production, together with the consequent modifications in the other sectors of the economy.²¹ The average annual rate of growth, according to this estimate, is 6 percent per year. While substantially lower than the Communist estimate of 9 percent, it is by no means a low overall rate of growth compared to many other nations.²²

All the adjustments described above can be criticized as more or less arbitrary. But, given the weaknesses in the Communist statistical system, the tendency of local producing units to exaggerate achievements, the known underreporting of crop production in the early

²¹ A smaller amount of production of agricultural products and consumer goods would reduce the incomes of the trading, transportation, and finance sectors, and would reduce the flow of raw materials to the handicraft sector.

²² See sec. 3 following.

fifties; the inexplicable 200 percent increase of unidentifiable consumer goods over a short period of 5 years, it would be even more arbitrary to accept the Communist statistics without adjustment. The question is whether the adjustments made are reasonable and plausible.

There are, of course, weaknesses also in the adjustments made by Liu and Yeh. In particular, the year to year change in the Liu-Yeh estimate of the value added by agriculture is unlikely to be as reliable as the average rate of change during the 6 years as a whole. For one thing, weather conditions have not been taken into consideration—it is indeed very difficult to calculate the effects of floods and drought on crop production. The adjustments made, however, are based on a detailed evaluation of the basic Communist statistics; and in all likelihood, they have reduced the margins of error in these data. A better knowledge of the economy of the Chinese mainland can be obtained only by improving the adjustments in the Communist statistics; it cannot be achieved by accepting the Communist data without correcting the known defects.²³

2. KEY INDICATORS OF ECONOMIC DEVELOPMENT FOR A COMPARATIVE APPRAISAL

There exist sufficiently detailed estimates of the components of the national product which, together with estimates of the labor force and some other data, make it possible to examine the pattern of economic growth in Communist China during 1952–57.²⁴ The analysis will be made on the format used by Kuznets for his appraisal of the U.S.S.R. in comparison with other countries.²⁵ This will enable us to compare the performance of the Communist Chinese economy during 1952–57 with those of many other nations during more or less the same period of time.

The national income estimates in table 5 readily fall into two groups distinguished by the rate of growth. One group (the Communist estimate, Hollister's estimate, the reconstructed Communist estimate by Li, and that reconstructed by Liu and Yeh) has average annual rates of growth of 8.6 to 9 percent during 1952–57. The growth rate of the other group (Liu-Yeh and Wu) is about 6 percent. The analysis below will be made on the basis of both the reconstructed Com-

²³ In a review in the *Journal of Political Economy* (Aug. 1965, pp. 419–421), Dernberger criticized the book by Liu and Yeh as having an "antidevelopment bias." He wrote that "Among the many assumptions made are that increases in output are proportional to increase in population, that value added is a constant proportion of the gross value of output, that the ratio between the outputs of two industries are constant and even that 'output is constant' (p. 420). He seems to have overlooked the following findings of the Liu-Yeh analysis: (1) The per capita product increased by 19 percent from 1952 to 1957 (Liu and Yeh, *ibid.*, table 16, p. 84), (2) the proportions of value added in the gross value of output of both producer and consumer goods, as estimated by Liu and Yeh, are extremely close to the Communist data themselves, which are also fairly constant over the 6 years 1952–57 (Liu and Yeh, *ibid.*, table F-18, p. 496), (3) the ratios between the outputs of different sectors changed significantly from 1952 to 1957 (Liu and Yeh, table 21, p. 89). The assumption that "output is constant" was made only for a negligible part of the total product, for instance, the services of domestic servants (Liu and Yeh, p. 206). The assumptions criticized by Dernberger were made by Liu and Yeh only for specific sectors and after a full consideration of the underlying conditions. Dernberger said that "the authors place great weight on the reasonableness of these crucial assumptions" (Dernberger, p. 420). Indeed, a reasonable criticism of these assumptions should be based only on an examination of the reasonableness of these assumptions; in his review, Dernberger did not do this.

²⁴ For a more detailed analysis, see Liu, "Quantitative Trends in the Economy of the Chinese Mainland, 1952–65," *op. cit.*, sec. III, and Liu and Yeh, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933–59*, *op. cit.*, ch. III.

²⁵ Kuznets, S., "A Comparative Appraisal," *op. cit.*

munist estimate by Liu-Yeh and the Liu-Yeh estimate itself. These two estimates are selected because they have both the gross and the net versions of the domestic product, together with the required employment data by sector. The different growth rates implied in the two estimates would probably satisfy readers with different degrees of belief in the reliability of the Communist data.

The tentative, preliminary, and incomplete nature of the comparative analysis presented here cannot be overemphasized. Kuznets, however, is correct in saying that, if it is desirable to have quantitative evaluations of the economic development of a given country, "there is surely more justification for comparing them with those for other countries."²⁸ Not much can be learned from the statistical measurements of the development of one country in one short period taken in isolation. In looking at the record of one nation for one period, people would be making international and intertemporal comparisons implicitly in their mind in any case. Comparative appraisal should be revised as better data became available; the poor quality of the existing information is not a valid consideration against getting some knowledge from preliminary comparisons, especially when estimates cover a range of possibilities (as indicated by the reconstructed Communist estimate and the Liu-Yeh estimate) are analyzed. In fact, international comparisons would also throw some light on the relative plausibility of the different estimates and point out directions for possible revision. Finally, for those who are not interested in tentative international comparisons, attention may be focussed only at the analysis of the data for the Chinese Mainland alone.

For making the comparative appraisal, certain key indicators of the pattern of economic development in Communist China during 1952-57 are presented in table 6.

TABLE 6.—*Indicators of economic development of the Chinese Mainland, 1952-57*
[In percent]

	Reconstructed Communist estimate	Liu-Yeh estimate
(a) Rates of growth of product, population, and employment per year, percent:		
GDP, 1952 prices:		
Total.....	9.0	6.2
Per capita.....	6.6	3.9
Per worker.....	4.9	4.6
NDP, 1952 prices:		
Total.....	8.8	6.0
Per capita.....	6.5	3.6
Per worker.....	4.7	4.4
Population.....	2.3	
Employment.....	4.0	1.5
(b) Average proportion of capital formation in domestic product, 1952 prices, percent:		
Gross.....	24.4	23.8
Net.....	20.6	19.8
(c) Incremental capital-output ratios, computed in 1952 prices:		
Total:		
Gross.....	2.7	3.9
Net.....	2.3	3.3
Fixed:		
Gross.....	2.0	2.8
Net.....	1.6	2.2

²⁸ Kuznets, *ibid.*, pp. 333-334.

TABLE 6.—Indicators of economic development of the Chinese Mainland, 1952-57—
Continued
[In percent]

	Recon- structed Communist estimate	Liu-Yeh estimate
(d) Rates of growth of inputs and productivity:		
Labor (L).....	4.0	1.5
Net fixed capital (K).....	6.8	6.5
Combined inputs (L at 7 K at 3).....	4.8	3.0
"Productivity" of combined inputs.....	3.9	2.9
(e) Total and per capita consumption in 1952 prices: 1952 and 1957 (index numbers, 1933=100):		
1952:		
Total.....	95.2	99.4
Per capita.....	83.7	87.3
1957:		
Total.....	137.8	123.4
Per capita.....	108.2	96.9
(f) Rates of growth of household consumption, 1952 prices, percent.....		
(g) Share of total consumption in gross expenditure, percent:		
1952.....	72.8	73.9
1957.....	71.8	70.3
Share of increase in consumption per capita in increase in gross expenditure per capita, percent:		
1952-57.....	68.4	48.5
(h) Shares of major sectors in net product, percent:¹		
1952:		
A sector.....	46.1	47.9
M+ sector.....	29.0	20.2
S- sector.....	24.9	23.9
1957:		
A sector.....	38.6	39.0
M+ sector.....	37.9	38.7
S- sector.....	23.5	22.3
(i) Shares of major sectors in labor force, percent:		
1952:		
A sector.....	69.9	72.9
M+ sector.....	17.1	15.5
S- sector.....	13.0	11.6
1957:		
A sector.....	73.1	72.9
M+ sector.....	16.4	16.6
S- sector.....	10.5	10.5

¹ For the meaning of the A, M+, and S- sectors, see text.

Source: Liu, T. C., "Quantitative Trends in the Economy of the Chinese Mainland," in Galenson, W., Eckstein, A. and Liu, T. C., editors, *Economic Trends in Communist China*, Aldine Publishing Co., 1966, tables 5-17.

3. GROWTH IN TOTAL, PER CAPITA AND PER WORKER PRODUCT

According to the Communist estimate, the rate of growth of the domestic product, 9 percent per year gross or 8.8 percent per year net (table 6, (a)), is higher than those of all the 44 non-Communist countries studied in Kuznets,²⁷ except Israel and Jamaica, during early postwar years; and it greatly exceeds the long-term growth rates of 12 industrialized nations given in the same source.²⁸ It is also higher than the estimated overall rates of growth for the U.S.S.R. during any period, except those computed in the 1928 (preindustrialization) prices for 1928-37 or 1928-40.²⁹ On the other hand, the Liu-Yeh estimates (6.2 percent gross and 6 percent net) are exceeded by 12 of the 44 nations compared in Kuznets' study.³⁰ On the basis of the Liu-Yeh estimates, however, the performance of the Chinese Communist economy still ranked far above the average of the 44 nations.

The two estimates of the rate of growth of per capita product (table 6, (a)) differ in about the same way as those of the overall rates. The

²⁷ Kuznets, *ibid.*, table VIII.4.

²⁸ *ibid.*, table VIII.3.

²⁹ *ibid.*, table VIII.1.

³⁰ *ibid.*, table VIII.4.

reconstructed Communist estimate outstripped those of 40 out of the 44 nations compared,³¹ and is also higher than those of the U.S.S.R. for all periods.³² The Liu-Yeh estimate, however, ranks the Chinese mainland above 32 but much below 11 non-Communist countries, and is somewhat higher than that for the U.S.S.R. during 1928-40.

The reconstructed Communist and the Liu-Yeh estimates of the rate of growth of the per worker product are close (4.6 and 4.9 percent, table 6, (a)), the higher Communist estimate of the growth rate of the total product is more or less compensated by the higher growth rate of employment. The implication of the two sets of estimates of per capita and per worker estimates, however, are very different. According to the reconstructed Communist data, there was an accelerated use of labor relative to population so that the per worker rate of growth is lower than the per capita rate. The Liu-Yeh estimate, on the other hand, shows that employment expanded more slowly than population, resulting in greater per worker than per capita growth.

4. CAPITAL FORMATION AND CAPITAL OUTPUT RATIOS

The rather substantial increase in the per worker product may be ascribed to a large extent to the significant Communist drive toward industrialization during this period. The effort the Communist regime has made in this direction is best indicated by the very high proportion of capital formation in the total product achieved during 1952-57 (table 6, (b)). The reconstructed Communist estimate and the Liu-Yeh estimate of the proportion of capital formation in total product are very close (about 24 percent gross and 20 percent net), the more rapid increase in the reconstructed Communist estimate of capital formation being more or less compensated by the greater rate of growth of total product.

These proportions of capital formation in total product, while high, are equaled or exceeded by the long period records of many industrialized nations,³³ but are substantially greater than those of the less developed countries during the same postwar period. It is clear that Communist China was making a much greater effort toward investment than most of the underdeveloped countries. These high rates of capital formation were made possible by an effective control of consumption through rationing and the more subtle means of taxation and forced saving and by the importation of Russian technology and capital equipment.

While the reconstructed Communist and the Liu-Yeh estimates of the proportions of capital formation in total product are roughly the same, the reconstructed Communist estimate of the rate of growth of total product, as we have seen, is significantly higher than the Liu-Yeh estimate. The incremental capital output ratios derived from the Communist data are therefore correspondingly lower than those derived from the Liu-Yeh estimate³⁴ (table 6, (c)). Take the gross total (in contract to fixed) capital output ratio as an example, the Liu-Yeh estimate is 3.9, whereas the reconstructed Communist estimate is only 2.7.

³¹ Kuznets, *ibid.*, table VIII.4.

³² Kuznets, *ibid.*, table VIII.2.

³³ Kuznets, *ibid.*, tables VIII.13 and VIII.14.

³⁴ The incremental capital output ratio can be derived by dividing the capital formation proportion by the rate of growth of product.

On the basis of Bergson's data on national income and Powell's and Moorstein's data on capital formation, Kuznets has found that the capital output ratios for U.S.S.R. were about the same during the two periods 1928-40 and 1950-58. The ratios are about 3.5 to 3.7 on a gross total basis, 2.6 to 2.8 on a net total basis. For fixed capital, the ratios are 3.1 to 3.2 for gross and 2.3 and 2.1 for net.³⁵ The Liu-Yeh estimates do not differ greatly from these estimates for U.S.S.R., whereas the reconstructed Communist ratios are substantially lower than the latter. Since during the First Five-Year Plan period, Communist China pursued a development program modeled on the U.S.S.R. and in fact used Russian designs for her major plants, the lower reconstructed Communist estimates of the ratios seem less plausible.

5. GROWTH IN "PRODUCTIVITY"

In spite of its popularity, the capital output ratio, as a measure of the input-output relationship underlying growth, leaves much to be desired. The role of labor is not explicitly brought out, and it gives no indication of the contributions of improvement in knowledge, technology, and organization and of the scale effect. The combined capital and labor input approach, while far from ideal, throws some light on these other factors. The computation of inputs in this paper is limited to labor and reproducible fixed capital. Arbitrary weights of seven and three are assigned to labor and capital respectively so that the results (table 6, (d)) can be readily compared with similar computations done by Kuznets for 10 industrial nations.³⁶

The reconstructed Communist estimate of the rate of growth of productivity³⁷ (3.9 percent per year) would outrank all the other nations studied by Kuznets, coming ahead of West Germany (3.8 percent), France (3.3 percent), Japan (3.1 percent), the Netherlands (2.6 percent), the U.S.S.R. (2.5 percent), and the other countries by increasing large differences. One could seriously doubt the plausibility of this outcome. On the Liu-Yeh estimate (2.9 percent per year), the Chinese mainland occupies the fourth place after West Germany, France, and Japan, but is still slightly ahead of the U.S.S.R. Since all the nations studied by Kuznets are developed countries, Communist China did rather well in terms of increase in productivity.

6. CONSUMPTION

The reconstructed Communist estimate and the Liu-Yeh estimate differ most sharply with respect to the impact of the industrialization drive on personal consumption. (Table 6, (e), (f), and (g).)

Both the reconstructed Communist estimate for the postwar years and the Liu-Yeh estimate for both the prewar and postwar periods indicate that per capita consumption was lower in 1952 than in 1933. The rates of growth of household consumption during 1952-57 are respectively 5.2 and 1.9 percent according to the two estimates. The Liu-Yeh estimate indicates that the 1933 per capita consumption level had not been regained as late as in 1957; whereas the reconstructed Communist estimate shows an increase of 8 percent in 1957 over 1933. That the Communist data on consumption is subject to severe reservation can be seen from the data given in table 6, (g). According to the

³⁵ Kuznets, *ibid.*, table VIII.12.

³⁶ Kuznets, *ibid.*, table VIII.14.

³⁷ For the meaning of productivity, see footnote 9, p. 51.

Communist estimate, the marginal consumption-total expenditure ratio during 1952-57 (i.e., the share of the increment in consumption per capita in the total increase in gross domestic expenditure per capita) amounted to 68.4 percent, not much below the reconstructed Communist estimate of the initial share of consumption in total expenditure in 1952 (72.8 percent). This means that, during this period of rapid industrialization, consumption shared about equally with the sum of the other categories of expenditure (including investment) in the total increase. This appears to be a rather unlikely situation. The Liu-Yeh estimate of the marginal increment ratio is 48.5 percent, substantially lower than their estimate of the initial ratio of 73.9 percent.

7. INDUSTRIAL STRUCTURE

The Communist industrialization drive has brought about a significant change in the industrial structure of the economy. (Table 6, (b) and (i).) The reconstructed Communist estimate and the Liu-Yeh estimate do not differ greatly in this respect. In 1952, on the eve of the First Five-Year Plan, about half of the total product originated in agriculture (A), a little more than a quarter in the M+ sector, and slightly less than a quarter in the S- sector.⁸⁸ With respect to the labor force, roughly 70 percent engaged in agriculture, 16 to 17 percent in the M+ sector and about 11 to 12 percent in the S- sector. Industrialization meant of course a reduction in the share of the total product originating in agriculture and an increase of the share of the M+ sector. These took place very rapidly from 1952 to 1957. A basically different pattern, however, emerged in the allocation of the labor force. The distribution of the labor force in Communist China was practically the same in 1957 as in 1952. This is so especially in the case of the Liu-Yeh estimate. The Communist estimate even reveals a slight increase and a small reduction in the shares of employment in agriculture and the M+ sector respectively. The change in the S- sector is very minor. The implication is clear. The increase in per worker product given in table 6, (a) was entirely due to the increase in output per worker in the different sectors; it was not at all the result of a shift of the labor force from a low yield sector to a high yield one. The increase in per worker product took place entirely in the M+ and the S- sectors, in both of which, however, there was a substantial shift from the traditional outfits to more modern establishments.

Some concluding remarks on the development during 1952-57 have been presented in the Summary section of this paper (p. 47).

IV. THE GREAT LEAP FORWARD AND ITS AFTERMATH, 1958-65

With the announcement of the Great Leap Forward in December 1957, the Central Communist regime in Peiping exerted tremendous pressure on local party members, directors of communes, and managers of local enterprises to expand production at a pace practically impossible to achieve. The accomplishments of a few pilot projects using concentrated technical skill and scarce resources under the most favorable conditions and closest supervision were expected to be dup-

⁸⁸ The M+ sector includes manufacturing, mining, construction, transport, communications, and certain components of utilities. The S- sector covers the rest of the economy other than A and M+.

licated by producers all over the country. Soon enthusiastic reports were pouring into Peiping from one locality after another claiming that the targets were being fulfilled and overfulfilled. When the *Communique on Economic Development in 1958* was issued in April 1959, the regime announced that the output of such important products as food crops, cotton, iron and steel had more than doubled during 1958, and that the gross value of agriculture and industry had increased about 65 percent.

It soon became apparent that these announced increases could not be true, as there was neither improvement in the food rations nor evidence of sufficient increases in the supply of industrial goods to sustain the claims. A drastic downward revision of the claims was announced in August 1959, reducing the estimated production of food crops and cotton in 1958 by one-third. The claimed increase in iron and steel production was scaled down in a more subtle way. It was admitted that roughly 30 percent of the iron and steel produced in 1958 was "native" and not really usable for modern industrial purposes. It is difficult to say what the native iron and steel were good for, but it is significant that the backyard blast furnaces were soon abandoned. As the output of iron and steel was not really reduced in the revised announcement, the total value of industrial production remained unchanged. The increase in agricultural production announced for 1959 was more restrained, but the increase claimed for steel and industrial production in general was high.

1. SOME EXISTING ESTIMATES OF THE POST-LEAP NATIONAL PRODUCT

Because of the "statistical fiasco" brought about by the Great Leap Forward in 1958, it has become extremely difficult to estimate Communist China's national product and its components since that year with a reasonably high degree of confidence. Some of the existing estimates of the post-1957 total product are presented in table 7, together with the estimates for 1957.

TABLE 7.—National product estimates of the Chinese Mainland, 1957-62

[Billions of 1952 yuan]

	Communist (net material product)	Hollister (gross national product)	Liu-Yeh (net domestic product)		Wu	
			Recon- structed Communist estimate	Author's own	Net domestic product	Gross domestic product
	(1)	(2)	(3)	(4)	(5)	(6)
1957	93.5	102.4	104.2	95.3	94.8	-----
1958	125.3	128.2	145.0	108.0	104.8	-----
1959	152.9	142.6	176.8	125.0	112.0	-----
1960	-----	158.1	-----	-----	112.5	-----
1961	-----	-----	-----	-----	73.2	-----
1962	-----	-----	-----	-----	-----	82.1 * 109.0 * (101.4)

¹ Conjectural estimate.

² Without taking into consideration possible "investment limitations and waste."

³ Taking into consideration possible "investment limitations and waste."

Sources: From the following pages in the publications cited in table 5.

Communist: Liu-Yeh, pp. 116 and 220.

Hollister: P. 2.

Liu-Yeh: Reconstructed Communist estimate, pp. 213 and 660. Authors' own, p. 66.

Wu: Vol. 1, p. 241 and vol. 3, pp. 120-122.

The Communist estimate and the reconstructed Communist estimate by Liu-Yeh for 1958 and 1959 were based on the extravagant Communist claims of increase of agricultural and industrial output. An overall rate of growth as high as 34 percent in a single year from 93.5 billion yuan in 1957 to 125.3 billion yuan in 1958 does not seem to belong to the realm of possibility. Hollister's estimate of an increase of 23 percent from 102.4 billion yuan in 1957 to 126.2 billion yuan in 1958, while lower than the Communist claim, appears to be quite unprecedented also.

After the dusts of the Great Leap have settled, it is certain that all the estimates for 1959 (including the exploratory estimate by Liu-Yeh and Wu's estimate of a modest increase of 7 percent from 104.8 billion yuan in 1958 to 112 billion yuan in 1959) are overestimates. A basic reason for this conclusion is that agricultural production not only did not increase from 1958 to 1959 but, as will be shown later (table 9), it actually declined substantially.

2. A RECONSTRUCTED COMMUNIST ESTIMATE OF THE DOMESTIC PRODUCT, 1958-65

While it is admittedly difficult to derive a reliable estimate of the national product for the post-Leap years, the importance of having even a crude picture of the recent economic trends compels us to make such an attempt. Before doing so, it is desirable to reconstruct from scattered Communist information the Communists' own estimate of the domestic product for these years. The reconstructed estimate for 1958-59 have been presented in column 3, table 7. A very crude reconstruction for the later years is possible on the basis of some Communist observations on food crops and on the total value of industrial production.

For the output of food crops, we have the report by Lord Montgomery after his visit to the Mainland that the total output for 1960 was 150 million tons.³⁹ Since that time, it has been reported in Communist sources that the 1962 output was "better than 1961", that the 1963 output was "better than 1962",⁴⁰ and that the 1964 output was "larger than 1957".⁴¹ Finally, we have the Communist claim that the 1965 output was about 200 million tons.⁴² By linear extrapolation on the 1960 and 1965 figures, the "Communist claims" for 1961, 1962, 1963, and 1964 may be put at 160, 170, 180, and 190 million tons.⁴³ On the assumption that the ratio of value added by agriculture to the output of food crops during 1960-65 is the same as in 1957,⁴⁴ agricultural net value added may be estimated at 32.6, 34.7, 36.9, 39.1, 41.2 and 43.4 billion 1952 yuan respectively for the six years 1960-65.

The net value added by manufacturing industries can be reconstructed in a similarly crude way. It has been reported by the Communists that the gross value of industrial output (manufacturing factories and handicrafts) increased by 18.4 percent from 1949 to

³⁹ *The Sunday Times*, Magazine Oct. 15, 1961.

⁴⁰ *Jen-Min Shou Tze*, 1964, p. 6.

⁴¹ Report by Chou En-Lai, *Jen-Min Jih Pao*, Dec. 31, 1964.

⁴² *Chinese News Summary*, Apr. 28, 1966, p. 1.

⁴³ The 1964 estimate, 190 million tons, is thus larger than that for 1957 (185 million tons). See the report by Chou En-Lai referred to in footnote 41 above.

⁴⁴ The 1957 ratio is computed from the data given in Liu and Yeh, *The Economy of the Chinese Mainland*, op. cit., p. 223.

1950.⁴⁵ Applying this percentage increase to the Liu-Yeh reconstructed Communist estimate of the net value added by manufacturing factories and handicraft for 1959,⁴⁶ the net value added in 1960 is estimated at 61.9 billion 1952 yuan. In a forthcoming paper by Chao,⁴⁷ the Communist estimate of the gross value of output of manufacturing factories and handicrafts has been reconstructed at 79.8, 88.6, 101.9 and 113.1 billion yuan for the 4 years 1962 to 1965. The net value added for the same years may be estimated at 23.4, 26, 29.9 and 33.1 billion yuan on the 1957 ratio of net value added to the gross value of output.⁴⁸ All sources are in agreement that industrial production declined from 1960 to 1962. The 1961 net value added is therefore estimated at 42.6 billion yuan, the average of the 1960 and the 1962 figures (61.9 and 23.4 billion yuan respectively).

Applying the 1957 ratio of net domestic product to the sum of agricultural and industrial value added,⁴⁹ we derive the reconstructed Communist estimate of net domestic product for 1960-65 (presented in table 1) from the estimates of the net value added by agriculture and industry given above for these years.

It is desirable to have an approximate picture of the rough order of magnitudes of the per capita product during this period. The rates of population growth during the post-Leap years, as given in various Communist sources, contradict one another. On the one hand, we have an estimate of 700 million, probably for 1965, given in a recent issue of *Jen-Min Jih Pao* (editorial, June 8, 1966). The average rate of growth during 1959 to 1965, implied in this estimate, is only about 1 percent per year. On the other hand, Chou En-Lai mentioned a 2-percent rate of growth for 1960-62.⁵⁰ In reconstructing the per capita product, an average rate of growth of population of 1.5 percent, the average the two Communist estimates, is used. It should be noted that, if this percent rate of growth of population is an underestimate, the reconstructed Communist estimate of the per capita product would be correspondingly overstated. The estimated per capita product during 1957-65 is presented in table 1.

The plausibility of the reconstructed Communist estimate of the domestic product must be evaluated. While the Communists have assigned a high priority to the allocation of resources for exports, the level of exports attainable is basically constrained by domestic output. To account for the time lag between domestic production and the arrival of exports at foreign ports, domestic product lagged by 1 year and exports are compared in table 8. The reconstructed Communist estimate of the domestic product increased very greatly from 1957 to 1959, but the percentage of exports in domestic product, with latter lagged 1 year, declined sharply from 4.5 percent for 1958 to 2.7 percent in 1960. Moreover, while the reconstructed Communist estimates of the domestic product for 1960 and 1961 (respectively 155.9 and 127.5 billion 1952 yuan) are a great deal higher than that for 1957 (104.2 billion yuan), the 1961 and 1962 percentages (respectively 2.3 and 2.8 percent) are substantially smaller than that for 1958 (4.5 percent). This indicates that the reconstructed Com-

⁴⁵ This percentage is given by Edwin F. Jones from a published Communist source.

⁴⁶ See Liu and Yeh, *ibid.*, p. 660.

⁴⁷ Chao, K. "Policies and Performance in Industry," in Galenson, Eckstein, and Liu, editors, *Economic Trends in Communist China*, *op. cit.*, sec. 3b.

⁴⁸ The 1957 ratio is calculated from data given in Liu and Yeh, *ibid.*, p. 223.

⁴⁹ This ratio is calculated on the data given in Liu and Yeh, *ibid.*, p. 223.

⁵⁰ *Jen-Min Jih Pao* (*Peoples Daily*), Dec. 26, 1963.

minist estimates of the domestic product for 1958-62 are likely to be overestimates.⁵¹ Since the reconstructed Communist estimates of the domestic product for 1963-65 are based on claimed increases of agricultural and industrial production over the exaggerated estimates for the preceding years, they are also likely to be overestimates.

TABLE 8.—Exports of Communist China compared with the reconstructed Communist estimate of net domestic product lagged 1 year, 1958-65

[Billions of 1952 yuan and percent]

	Exports	Recon- structed Communist estimate of net domestic product lagged 1 year	Percentage of exports in lagged domestic product
	(1)	(2)	(3)
1958.....	4.65	104.2	4.5
1959.....	5.31	145.0	3.7
1960.....	4.74	176.8	2.7
1961.....	3.59	155.9	2.3
1962.....	3.59	127.5	2.8
1963.....	3.67	99.5	3.7
1964.....	4.55	107.4	4.2
1965.....	4.91	117.3	4.2

Exports:

1953-64: Supplied by F. H. Mah.

1965: *Current Scene*, Feb. 1, 1966, p. 2. The exchange rate used in converting the U.S. dollar value to yuan is 1 U.S. dollar equals 2.355 yuan.

Net domestic product: Table 1. (Also see text.)

3. AN EXPLORATORY ESTIMATE OF THE DOMESTIC PRODUCT, 1958-65

In spite of the practically total blackout of statistics on commodity output from Communist sources on the Mainland since 1960, there has emerged a set of rough but educated estimates of the output of food crops and cotton during 1959-65. These data, prepared by the U.S. consulate general in Hong Kong on the basis of piecemeal information on acreages and yields, are the most generally accepted estimates of the recent trend of output by qualified sources in Hong Kong and are given in table 9.

TABLE 9.—Estimates of the output of food crops and cotton, 1957-65, by the agricultural officer, U.S. consulate-general, Hong Kong

	Food crops (million metric tons)	Cotton (million bales)
1957.....	185	1.6
1958.....	194	1.9
1959.....	168	1.8
1960.....	160	1.4
1961.....	167	.9
1962.....	178	.9
1963.....	179	1.0
1964.....	183	1.2
1965.....	180	1.3

Source: Reported in Emery, R. F., "Recent Economic Development in Communist China," *Asian Survey*, June 1966, pp. 303-304.

⁵¹ Since the export data used are compiled from the import data of the countries having trade relations with Communist China, they are fairly reliable data. While, during the difficult years 1961-62, the percentage of exports in domestic product may be expected to be smaller than the more normal years 1957-58, the decline was too sharp to be plausible, especially since the reconstructed estimates of the domestic product for those years are substantially higher in absolute terms than that for 1957.

Agricultural output declined precipitantly from 1958 to 1960. Recovery in food crops production began in 1961. The output of cotton, the major commercial crop, lagged behind and did not start to recover until 1963. As late as in 1965, neither food crops nor cotton has regained the 1957 level.

The movement in heavy industrial output may be typified by the output of steel. Estimates of steel output by sources in Hong Kong are given in table 10, together with the estimate made by the U.S. Bureau of Mines and some other data. The figures given for 1958-60 in columns 1 through 4 are Communist claims, and all non-Communist sources are in agreement that these data are highly inflated. Starting with 1962, the scattered data in columns 1 through 3 begin to converge to a fairly uniform pattern. The estimate made by the U.S. Bureau of Mines (column 4) differs rather sharply from those given in columns 1 through 3. It is explained by the Bureau of Mines, however, that these figures may be "grossly exaggerated by perhaps one-fifth or more."⁵² No opinion is expressed on how much "more" than one-fifth. If the exaggeration were from one-fourth to one-third, the estimate by the Bureau of Mines for 1962-64 would be quite close to those in the first three columns. It is clear that steel production fell substantially from 1959 or 1960 to 1962 and then recovered from 1962 to 1965.

TABLE 10.—Scattered data on steel and electric power, 1957-65

	Steel (million metric tons)					Electric power, Emery			
	Current Scene	Emery	Far Eastern Economic Review	U.S. Bureau of Mines	Liu-Yeh	Data used in this paper		Quantity (billions of kilowatt-hours)	Index (1957=100)
						Quantity	Index (1957=100)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
1957	5.35	5.2	5.35	-----	5.35	5.35	-----	19.0	-----
1958	18.00	18.0	111.08	-----	6.3	6.3	-----	127.5	-----
1959	113.35	113.4	113.35	113.35	8.9	8.9	-----	141.5	-----
1960	118.45	118.5	118.45	118.45	-----	8.4	-----	158.0	-----
1961	-----	-----	11-12	9.5	-----	7.9	-----	-----	-----
1962	7-8	-----	7-8	10.0	-----	7.5	-----	-----	-----
1963	7-9	7.0	8-9	12.0	-----	8.0	149.5	30.0	157.9
1964	8-10	-----	10	14.0	-----	9.0	-----	-----	-----
1965	-----	10.0	12	-----	-----	10.0	186.9	33.0	173.7

¹ Communist claims.

Sources:

Col. (1): Apr. 15, 1965, p. 9.

Col. (2): *Asian Survey*, June 1966, p. 307.

Col. (3): Mar. 31, 1966, p. 623.

Col. (4): Mimeographed sheet obtained from the U.S. Bureau of Mines.

Col. (5): Liu and Yeh, *The Economy of the Chinese Mainland*, *op. cit.*, pp. 454 and 681-683. The 1958 and 1959 figures are obtained respectively by dividing the value figures of 3.8 and 5.36 billion yuan by the price of 800 yuan per ton.

Col. (6): For 1957-59, the data given in col. (5) are used. The 1962 figure is the midpoint of the range given in cols. (1) and (3). The figures for 1960-61 are obtained by linear extrapolation on the 1959 and 1962 data. The 1963 and 1964 data are the midpoints of the ranges given in col. (1). The 1965 figure is taken from col. (2). It is seen from cols. (7) and (9) that the steel figures for 1963 and 1965 bear relationships to that for 1957 similar to the data on electric power.

Col. (8): *Asian Survey*, June 1966, p. 307.

⁵² This qualifying statement was originally given for the 1959-60 estimates in the *Minerals Yearbook, 1963*; but in the more recent mimeographed sheets distributed by the Bureau, it is given for the estimates for all the years 1959-64.

A model of 16 structural relationships was developed in a previous paper⁵³ for estimating domestic product and investment for 1959-65, together with the value added by the two main branches of the economy (the traditional sectors and the relatively modern ones), on the basis of the data given in tables 9 and 10. The parameters in most of the structural relationships were estimated from the input-output relationships observed during the statistically more reliable years 1952-57. The derivation of these equations will not be discussed here,⁵⁴ the main feature of the model, however, can be outlined by giving a verbal explanation of these relationships as follows. The value added by modern factories is determined by the agricultural and mining raw materials consumed. Agricultural raw materials consumed is assumed to be a function of the output of the agricultural sector of both the current and the preceding years. The total amount of mining raw materials consumed by modern factories is extrapolated on the quantities of coal and iron ore produced by modern mines. However, since the data on the latter two items are rather confused during recent years, a relationship is derived for estimating these quantities from the data on steel. The value added by all traditional sectors is related to the value added by agriculture; and that by the relatively modern sectors as a whole is determined by the value added by modern factories. The domestic product is obtained as the sum of the value added by the different sectors. The levels of employment in these sectors are then estimated on the basis of the value added by the respective sectors. Per capita consumption is then related to per capita productivity. Finally, domestic investment is derived by subtracting consumption from the total product.

With this system of equations obtained, the domestic product and investment for 1959-65 can be calculated in a straightforward manner on the basis of the estimates of food crops, cotton, steel, and some other data. For the estimates on food crops and cotton, the figures presented in table 9 are accepted. The data on steel used in the computation are presented in column 6 of table 10.⁵⁵ The estimate of net product obtained has been presented in column 5 of table 1. The estimate of net domestic investment is given in table 11.

TABLE 11.—*Estimate of net domestic investment, 1957-65*

	Net domestic investment (billions of 1952 yuan)	Proportion of net domestic investment in net domestic product (percent)
1957.....	18.2	19.1
1958.....	23.6	21.9
1959.....	20.0	19.2
1960.....	17.1	17.8
1961.....	15.6	16.9
1962.....	15.7	16.7
1963.....	16.7	17.0
1964.....	18.1	17.4
1965.....	19.5	18.0

Source: Liu, T. C., "Quantitative Trends in the Economy of the Chinese Mainland," *op. cit.*, table 25.

⁵³ Liu, T. C., "Quantitative Trends in the Economy of the Chinese Mainland," *op. cit.*, section V.2.

⁵⁴ For a full explanation of the model, see the paper cited in the preceding footnote.

⁵⁵ For the derivation of these data, see the footnote to column 6 of table 10.

The decline of the domestic product from 1958 to 1961 confirms the deepening difficulty encountered by the economy during these years. (Table 1.) The domestic product in 1961, 92.2 billion 1952 yuan, was 15 percent lower than the 1958 peak of 108 billion 1952 yuan. The economy began to recover in 1962. The annual rate of recovery, as measured by the percentage growth in domestic product, increased from 2 percent in 1961-62 to 6.2 percent in 1963-64. The speed, however, slackened to 3.7 percent during 1964-65, mainly due to the drought in Northern China.

The 1957 level of domestic product was regained during 1962-63, and the 1965 product was about the same as in 1958. The economy in 1965 stood where it was in 1958, a "loss" of 7 years without growth.

Net domestic investment decreased by 34 percent from 23.6 billion 1952 yuan in 1958 to 15.6 billion in 1961. (Table 11.) The proportion of investment in total product declined fairly consistently from 21.9 percent in 1958 to 16.7 percent in 1962. By 1965, however, investment exceeded the magnitude reached in 1957, but the proportion of investment in domestic product in 1957 had not yet been fully regained.

The plausibility of the post-1958 estimate must be investigated. The product estimate can be checked against the data on exports, and the investment estimate examined in the light of certain Communist policy pronouncements.

As shown in table 12, the ratio of exports to domestic product, with the latter lagged by 1 year, rose fairly consistently from 1952 to 1959, within a range of 3.6 to 4.9 percent. This proportion fell from 4.9 percent in 1959 to 3.7 percent in 1961, reflecting the increasing difficulty experienced by the economy; ⁵⁶ it recovered thereafter quite consistently to 4.7 percent in 1965. The post 1960 range of this proportion, 3.7 to 4.7 percent, is close to the one observed during 1952-57; but the ratios for the most difficult years 1961-63, 3.7 to 3.9 percent, are lower than those in the best years 1956-57 before the Leap and those attained in 1957-60 under the initial impetus of the Leap. The

TABLE 12.—Exports and net domestic product lagged by 1 year

	Exports (billions 1952 yuan)	Net domestic product lagged by 1 year (billions 1952 yuan)	Percent of exports in net domestic product
1953.....	2.59	71.4	3.6
1954.....	2.82	75.3	3.8
1955.....	3.36	79.3	4.2
1956.....	3.98	82.3	4.8
1957.....	3.89	92.1	4.2
1958.....	4.65	95.3	4.9
1959.....	5.31	108.0	4.9
1960.....	4.74	104.4	4.5
1961.....	3.59	95.9	3.7
1962.....	3.59	92.2	3.9
1963.....	3.67	94.1	3.9
1964.....	4.55	100.8	4.5
1965.....	4.91	104.2	4.7

Source: Liu, T. C., "Quantitative Trends in the Economy of the Chinese Mainland," *op. cit.*, table 26.

⁵⁶ The drop, however, is much less drastic than the implausible decline reflected in the reconstructed Communist estimate. See table 8.

picture reflected by these data appears plausible. While the foreign trade data are also subject to a substantial margin of error, they are derived from the statistics of countries having trade relations with the Chinese mainland and are more reliable than our exploratory estimate of the domestic product. That a reasonable relationship exists between the data on exports and the product estimate would lend credibility to the latter.

Our estimate of net domestic investment (table 11) indicates a very substantial decline from 1958 to 1961-62. Investment in 1963-65 was still low in its ratio to the total product as compared to 1957 and the leaping years 1958-59. The magnitude of investment during 1962-65 (15.7 to 19.5 billion 1952 yuan), however, remain substantial. This may seem to contradict certain policy pronouncements of the Communist regime.

When the agricultural crises continued into 1960, the Eighth Plenum of the Central Committee decided early in 1961 that since there had been tremendous development in heavy industry in the last 3 years, its output of major products already far in excess of the planned level for 1961 and 1962, the scale of basic construction should therefore be appropriately reduced.⁵⁷ Moreover, it is known that in December 1961 the Communist Party issued a secret document to cadres in the field directing that all basic construction should be suspended, all those enterprises that had been operating regularly at a loss be shut down, and the practice of recruiting labor from rural areas be abandoned for at least 3 years.⁵⁸ Then on March 27, 1963, Chou En-lai again reported the decision to reduce basic construction.⁵⁹

In view of the apparently firm decision to cut down capital construction since 1961, it may be questioned whether investment in 1961-65 could have been as high as our estimate indicates. It is of course possible that the investment estimate presented in table 11 is unreliable. Yet there are grounds to believe that the actual investment may not have been significantly below our estimate.

(1) According to our estimate, the average level of investment during 1961-63 (16 billion 1962 yuan) was lower than that during 1957-59 (20.6 billion 1952 yuan) by 4.6 billion yuan. In view of the large number of construction projects known to be underway at the end of 1959, the momentum might have been such that a more drastic curtailment was not possible to enforce, in spite of the announced policy of entrenchment. By 1964 the domestic product exceeded the 1957 level (table 1), and the policy of curtailing investment may have been relaxed. Moreover, while the 1965 product was virtually the same as in 1958, our estimated investment for 1965 is substantially smaller than that for 1958.

(2) While basic construction in general may have been reduced, it is known that the Communist regime increased investment in the petroleum and fertilizer industries and significantly expanded the production of tractors and other farm equipment. Investment relating to the production of atomic weapons must have been very substantial. It would not be possible, however, to make a quantitative estimate of the investment in these areas at the present moment.

⁵⁷ Li, C. M., *Industrial Development in Communist China*, New York and London, p. 10.

⁵⁸ Li, *ibid.*, p. 11.

⁵⁹ Li, *ibid.*, p. 11.

(3) Another possible explanation of the substantial amount of investment during 1961-65 is an excessive increase in the stock of inventory. Steel, machinery, and other producers goods were perhaps actually produced in quantities compatible with the investment estimate, but they were merely being piled up. They had not been installed and put to use. A degree of confusion in the management of economic affairs may have existed after the agricultural crises during 1959-61. Orders were issued to curtail basic construction; but there was no corresponding reduction in the production of those producers goods which did not rely upon agriculture as the major source of raw materials. In fact, the regime may have been more anxious to avoid the difficult problem of excessive unemployment, already serious due to the slowing down of activities in such industries as textiles and food processing, than the problem of excessive stockpiling.

Some tentative concluding observations on the post-Great Leap Forward period have been given in the Summary section of this paper.

**THE EMERGING PATTERN OF CHINA'S
ECONOMIC REVOLUTION**

BY

EDWIN F. JONES

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THE EMERGING PATTERN OF CHINA'S ECONOMIC REVOLUTION

INTRODUCTION

During 1966 political developments have overshadowed economic events in the news coming out of China, and the analysts have concentrated on speculating over the Pandora's box of political troubles that the Mao-Lin forces may have opened in mounting the "socialist cultural revolution." Understandably, economists demur from venturing opinions in the absence of data. But this is unfortunate, for the current struggles appear to concern the next step in China's economic revolution. Economists could do much to clarify the imperatives and the areas of maneuver that confront the combatants.

The Third Five-Year Plan period (1966-70) has begun this year. After the Great Leap collapse in 1960, China traversed a painful retrenchment which it terms the "readjustment" of 1961-63 and has secured an initial recovery which it terms the "upsurge" of 1964-65. China is thus in a position to renew planned development. Peking has been drawing up the Third Five-Year Plan since at least 1962, and at the end of 1965 appeared on the verge of announcing it at a National People's Congress. But political differences then intervened. The Congress was not held, and little has been said on the plan through 1966. The plan's status is thus in doubt.

The plan that had been drawn up was a grim, if ambitious, one. It demanded that China postpone rapid social and economic progress to secure itself as the new base for world revolution, safe from external military and economic aggression and from internal subversion. To this end, it accepted a modest annual economic growth of 4 to 5 percent, based on an annual expansion of 2 to 3 percent in agriculture and 5 to 7 percent in industry. It asserted that its real achievement would lie in implementing certain "revolutions" or changes in Chinese society as follows: (1) farm development and population control would realistically secure China's minimal food needs; (2) heavy military investments, particularly in advanced weapons, would advance China far toward the status of a world power; (3) a heavy investment in autarky, stressing technological growth and the "filling out" of industry, would secure an independent and modern industrial base; and (4) "political and cultural revolutions" would secure the necessary commitment to this hard course from the party and from society.

As China approached the Third Five-Year Plan period, it had made progress on all but the last of these goals. The first three goals depended essentially on China's small corps of highly trained technicians, and their efforts, in the research programs and on about 10 percent of China's farmland, have achieved concrete and observable results. But these programs have not touched much of Chinese society, nor have they provided significant employment to the huge

numbers of recent graduates turned out by China's expanded education system. The recent successes, then, have generated little sense of dynamism or hope in Chinese society.

In consequence, the programs for political and social change, called for at the Tenth Plenum of the Eighth Central Committee in September 1962, have generated much motion and little movement. Society and the lower levels of the Party have been concerned with daily problems and diminished personal prospects, and have tended to fulfill the letter but not the spirit of Peking's directives, avoiding painful change through appropriate excuses and bureaucratic devices. Chinese society shows little interest in the outside world, and Mao's audacious plans to reshape this world do not excite it. The pleas of the Party Central to instill the "world view" in Chinese society have simply fallen on deaf ears.

With the approach of the Third Five-Year Plan, Mao appears to have become increasingly agitated over flagging progress on this fourth goal, stemming, it may be believed, from deep conviction that without an overt commitment to the program from responsible Party officials and from society there would be neither the will nor the willingness to sustain the sacrifices the program entailed. The recent political charges that have been aired, particularly since the Eleventh Plenum of August 1966, suggest that a counterview was strongly held in the Party leadership which argued that the kind of commitment that Mao sought simply could not be secured in the critical period to 1970 and that a determined effort to obtain such a commitment would so disrupt Chinese society as to threaten all of the other goals. In addition, it is likely that a number of the leaders opposed the rationale of the plan, but it is doubtful that any were so bold as to attack it frontally.

Mao, of course, is having his way. He was elevated to top Party rank and gathered around him a clique of loyal, fanatic men (plus Mao's wife), which is attempting to consolidate and exert power. Secondary and higher schools have been closed, preparing for major educational reform which is to increase indoctrination, limit promotion to students of worker/peasant origin, and reduce graduates' expectations of their social prospects. Most of the idle student bodies have been organized in Red Guard units and have been given the exhilarating task of policing society, attacking any sign of privilege or possessions in the name of egalitarianism, and fanning latent Chinese xenophobia presumably for later translation into the "world view." The Red Guards have also, with high level approval, attacked and criticized Party officials, a move apparently aimed at creating tensions which force a commitment of support, or at least inhibit organized resistance, from important Party elements.

The question remains as to whether Mao or his opponents have correctly predicted the outcome. But before speculating on this question, the existing situation in the various economic sectors should be examined in more detail.

POPULATION AND AGRICULTURE

A new appreciation of the food-population balance became evident in post-1960 China in the wake of the 1958-60 setbacks to agriculture and the 1959-62 famine. The urgent emphasis given to farm and

population policies, particularly since 1963, reflects Peking's realistic appraisal of the difficulties of reaching and sustaining an equilibrium between the population and its sustenance. But it does not do more. To Mao, rice is an intermediate good (as bread was to Stalin). Peking promises to regain 1957 levels of per capita farm output by 1970, but significant increases above this level are projected only in distant and dubious promises for 1980 and later years.

POPULATION

Peking is uncertain as to the exact level of its population. At the end of 1964, Mao told Edgar Snow that the registration data were inflated, since rural areas were concealing deaths to augment rations. Snow obtained from Chinese agricultural officials an estimate of grain requirements of 220 million tons, implying a 1964 yearend population of 733 million at the conventional 300-kilogram per capita standard. But Mao had cited estimates of 680 to 690 million. Other evidence suggests that Mao's figures were independent estimates of the actual population in mid-1963, which was first placed at 680 million in estimates given to the National People's Congress at the end of 1963, but was later reestimated at 690 million after the mid-1964 "census." Projecting these data to the end of 1965, Peking's population estimates would range from 728 to 750 million, the higher representing registration figures and the lower an estimate of the actual population.

This uncertainty, however, relates only to the question of whether China's population growth was set back by 40 or 60 million persons during the 1959-62 famine through reduced fertility and life expectancy, and not to the basic demographic forces. Peking's view remains that the Chinese population prior to 1948 was nearly stable under conditions of high mortality, and subsequently began to grow rapidly through an increase in life expectancy occasioned by social stability and rudimentary public health measures. Under these conditions, population growth was centered during 1948-63 in dependent age groups, where the risks of death are greatest. During 1963-78, however, the greatest expansion can be expected in the working age group, based on a very substantial growth in the 15 to 29 year age group.

This pattern of growth places a particular urgency on population control measures at the present time. The 20- to 29-year age group is the most fertile of all age groups, and its impending rapid increase raises the prospect of an accelerating birth rate in the absence of a voluntary reduction in fertility. A vigorous birth control program has been waged in the cities since early 1963, employing rather stringent social pressures and evidently achieving significant results. Its extension to the rural areas is as yet limited, and possibly experimental, and few successes have been noted. However, a recent hardening of pressures in some rural areas, such as denying rations to fourth and subsequent births, may be effective.

The birth control campaign is long term in character. Its goals, as indicated by Premier Chou En-lai to Edgar Snow, seek to reduce the annual natural increase to 2 percent by 1970, 1.5 percent by 1980, and 1 percent by the year 2000. These goals are ambitious. How-

ever, in view of the present official determination and successes, the new effective birth control techniques, and the prospective revolutionary change in Chinese society, these goals are not impossible.

This demographic pattern also portends a more rapid growth in the working age population. According to the population model (see table I), the working age population grew by less than 1 percent annually in the 15 years to mid-1963, but will grow by 2.25 percent annually in the subsequent 15 years. The growth in the latter period will be concentrated in the 15- to 29-year-age group, and will be comprised of persons more vigorous, mobile, and better educated than the rest of the labor force. This first postliberation generation, because of its indoctrination, is likely to have cut its ties with the past and to have high, unfulfilled expectations of the future, suggesting that it will be restless, disillusioned, and volatile. Its employment may provide the Chinese leadership with both opportunities and problems.

AGRICULTURE

Farm output has increased substantially since 1960, although it has not yet recovered 1957 per capita levels. Recovery forces generated a large part of the increase, reflecting better than average crop weather and organizational reforms which improved production incentives as compared with the Great Leap period. But the permanent damage to farm resources during the Great Leap and the continuing growth of the population (and consumption needs) required much more than simple recovery. A substantial investment of production resources has augmented recovery growth, including an increase in the rural labor force and an expanded supply of industrial materials for farm modernization.

The Great Leap inflicted serious losses in large (draft) animals on Chinese agriculture. Samples of provincial data indicate that in farm areas (excluding the pastoral areas of Inner Mongolia, Tsinghai, Sinkiang, and Tibet) the draft animal population had dropped by 1961 to less than half the 1957 level. These numbers recovered slowly through 1963, and more rapidly to 1965, when they had reached a little over 60 percent of the 1957 level. These sample estimates are corroborated by Peking's announcement of emergency measures to encourage breeding and to equalized the distribution of draft animals in the farm areas, and by its warning that these policies must be maintained on a long-term basis to solve the draft animal shortage. This data indicates a serious loss of animal labor power which cannot be repaired until well into the 1970's.

The Great Leap also caused a loss in arable farmland. After adding to the official acreage data the 8 million hectares discovered during land reform (1950-52) and the 2 million hectares discovered during collectivization (1956), China's farmland is shown to have increased from 108 million hectares in 1949 to 110 million hectares in 1952 and 112 million hectares in 1957. But an estimate of 1.6 billion *mou* (106.7 million hectares) for 1963 has been published in the Chinese press, which has also disclosed great official concern over the acreage losses. Two important causes described in the press has been salinization of land in the north through improper irrigation schemes and

excessive removal of land in ill-planned and grandiose irrigation schemes.

Against these losses, there has been a recent marked increase in the rural labor force. Population studies suggest that the rural labor age population grew 7 percent between 1952 and 1961, or 0.75 percent annually, reflecting the slow growth in the total working age population and urban migration. Between 1961 and 1965 this growth increased to 12 percent (3 percent annually), reflecting a return of urban population to the rural areas and a more rapid growth in the working age population. If current policies do not change, a further 13-percent growth in the rural working age population can be expected by 1970 (2.5 percent annually).

This increase in the rural labor force has had important effects. It appears to have mitigated the draft animal shortage through the substitution of human for animal labor. In the "modernizing" areas, it has assured that, where the supply of water and fertilizer has increased, the labor supply has not inhibited intensification of output. But the major part of the farm labor increment appears engaged in low-productivity employment, reflected in a current concern in farm planning to diversify farm activities and enlarge the farm enterprise.

The "modernizing" sector of China's agriculture is much too small at present to provide high-productivity employment to more than a small fraction of the rural labor force increment. Planning discussions in Chinese technical journals suggest that the bulk of the new farmworkers are expected to engage in low-productivity activities, augmenting the inadequate growth prospects of Chinese agriculture until the modernizing sector has expanded to the point where it can fulfill this function. This point will not be reached until well into the 1970's, and until then, Chinese agriculture is not expected to be marked by rising labor productivity.

A fairly well defined "modernizing" area has appeared in recent years, based on industrial inputs and centering particularly on electrification, mechanical pumping installations, and increased chemical fertilizer supplies. Cost and convenience has limited these areas to urban environs, and in practice most of the effort has been concentrated in the densely settled Yangtze and south China lake plains and deltas. The area of concentrated effort does not seem to involve more than 10 percent of the farmland, although, since this is high-yield land, it may account for 20 to 25 percent of farm output.

Marked results seem to have been achieved at relatively low total and state costs on this limited area. The post-1960 industrial decline left surplus power capacity, and the opportunity cost of electrifying these dense agricultural areas has been minimal. Mechanical pumps, involving simple technology, have been easy and cheap to produce, and the prosperous communes in these areas are reported to have financed three-quarters of the cost, limiting state subsidies. Between 1957 and 1966 chemical fertilizer supplies from output and imports have increased by at least 7 million tons (ammonium sulphate equivalent) and possibly more (depending on the interpretation of confused output data). High rural prices for nitrogen fertilizers suggest that the state is recovering its costs, and the high rural de-

mand at these prices which has forced rationed allotments suggests a production response exceeding 3 tons of grain per ton of ammonium sulphate (equivalent). However, phosphate fertilizers, which have been promoted because of their ease of production and which constitute 20 to 25 percent of the supply, have been very cheap and freely available, suggesting state subsidies and low production efficiency in their use.

Emigrant reports and evidence of less stringent rationing mechanisms suggest a per capita grain supply approaching 1957 levels. However, large-scale grain imports and long-term grain purchase contracts suggest that grain output not only is less than the supply by the amount of the imports but may not be supporting former levels of stock accumulation. The orientation of crop acreage toward grain production, which occurred in 1961-62 at the height of the food shortage, seems not fully redressed to 1957 proportions. Thus, farm production retains an abnormal orientation toward grain output at the expense of other farm products, and per capita grain output is still below 1957 levels. Tables II and III present tentative estimates of China's farm output reflecting these considerations.

These output indications suggest that between 1957 and 1965 grain output increased 8 percent and farm output somewhat less. This annual growth rate of less than 1 percent is clearly inadequate, but it is not a fair guide to the future. The Third Five-Year Plan, as indicated by Premier Chou En-lai to Edgar Snow, intends to regain 1957 per capita levels of farm output by 1970, suggesting an annual growth target of 3 percent. But, if we assume that areas with three-quarters of farm output are to receive only additional labor inputs, and that this marginal labor has only half the average farm labor productivity, these areas would contribute just under 1 percent annually to total farm growth. In this case, to raise the total growth rate to 3 percent per annum, the "modernizing" areas would have to expand output by 8-9 percent annually, an impossible high growth rate.

It may be suspected that the Chinese planners are only hoping for a 2 percent annual growth rate in agriculture, requiring an annual growth of 4-5 percent in the "modernizing" sector. Discussions in Chinese technical journals have pointed out that it is the growth in the "modernizing" sectors that is important for augmenting state resources, and hence that it is this growth, and not overall growth, which is critical to economic planning. These remarks suggest a Chinese awareness that a 3 percent annual farm growth is an overambitious target at the present time.

The pattern of development which emerges from the discussions in Chinese farm journals is one which concentrates on the present "modernizing" areas where conditions are favorable during the Third Five-Year Plan. After 1970 it will be necessary to extend farm "modernization" to areas with presently about half of the farm output. Although certain preparation in experimental programs will be made in these areas during 1966-70, returns to "modernizing" inputs are expected to drop sharply in a less favorable environment. However, since industrial output is expected to accelerate its growth after 1970, it is expected to provide an offset through a marked increase in the supply of "modernizing" inputs.

This pattern of development involves dual patterns of farm organization. Through 1980 many farm areas will not be touched by "modernization" and must seek to expand output with local resources, using the policies employed in the 1950's. Both "modernizing" and other areas will retain collective organization. But "modernizing" areas are expected to organize in larger collective units with more sophisticated management techniques, and while peasants in these areas will be allowed incentive increases in personal incomes, they are expected to contribute from their production increments to the support of the state and the financing of agricultural investment. In the other areas, collective organization will remain decentralized, with perhaps increasing emphasis on political controls, for peasant incomes in these areas will be stable or declining.

INDUSTRIAL OUTPUT AND INVESTMENT

China secured a remarkable, if unstable, growth in industrial output and investment in the past 17 years. These two sectors are often considered together because of the reciprocal relation between them, which was strong in China's case. Industrial growth emphasized the expansion of capital goods industries in support of capital construction. In turn, a high rate of investment increasingly oriented toward industry supported rapid industrial growth, which can be expressed in the familiar capital input to output ratio.

China secured a high rate of investment approaching 20 percent of its GNP early in the 1950's. This rate soared during the Great Leap and plummeted sharply but briefly in the post-1960 "readjustment." From all indications, it has now again recovered to about the 20-percent level. Such a rate provides a respectable capacity to alter the material environment and to solve China's material problems.

But the urgent material problem that China sees is not that of inadequate economic growth, the consequences of which can be held in check by political measures. Rather it is China's present military weakness and dangerous dependence on external resources, which both inhibit and discredit the serious revolutionary challenge that China is attempting to throw at the world. Thus, it is China's ambition, rather than a clear lack of resources, that limits its economic growth and threatens its stability.

INDUSTRIAL OUTPUT

The general trends of industrial output in the past 17 years are fairly clear, although the precise magnitudes in recent years are a matter of some debate. Table V presents an estimate of the industrial output index, which shows this output doubling during the First Five-Year Plan (1953-57), doubling again during the Great Leap (1958-60), declining by 40 to 45 percent during the "readjustment" (1961-63), and subsequently recovering to a 1965 level perhaps 50 percent over the 1957 level.

Looking at the sources of this growth, the industrial labor contribution in the First Five-Year Plan involved a 50-percent increase in employment and a 40-percent increase in labor productivity. The former reflected a rapid growth in operating plant through rehabilitation

measures and stable production policies which permitted an increasing utilization of plant capacity. The latter was in part structural, reflecting the increasing weight of heavy industry in which labor productivity was relatively high, and in part the result of stable production which permitted the development of an experienced and skilled labor force.

The Great Leap sought to substitute labor for capital, and the industrial labor force tripled while productivity declined by a third. This policy greatly increased industrial costs, which played a major role in bringing the Great Leap to a halt. During the "readjustment" the urban population, which had increased from 92 million in 1957 to 130 million in 1960, was reduced to 110 million in 1963, and industrial employment appears to have been roughly halved in this period. Since industrial output declined nearly as much, labor productivity did not increase much by 1963. However, the subsequent "upsurge" recovery has been accomplished with little observed labor hiring, suggesting that industrial labor productivity had by 1965 approximately regained 1957 levels.

The capital contribution to industrial growth has also shown interesting variants. China inherited in 1949 very extensive industrial foundations that were built in the preceding decades in Manchuria and elsewhere, but which have often been overlooked by analysts because, for various reasons, they never attained more than a fraction of their production potential. During 1949-52 investments in working capital primarily secured the initial industrial growth that permitted a high level of capital construction during the First Five-Year Plan. Some 70 percent of the increase in industrial output in the First Five-Year Plan was scheduled to come from increasing utilization of existing plant and from the rehabilitation and reconstruction of existing plant. By 1957 industrial output was far higher than in any pre-1949 period, but 80 to 85 percent of it was based on plant existing in 1949 and had been secured at low investment costs. The major share of industrial capital construction during the First Five-Year Plan could thus be allocated to large-scale modern plants whose long term in construction prevented their addition to operating capacity until after 1957.

A large amount of new plant capacity came into operation during the Great Leap, including large-scale modern plants begun during 1953-57 and small and medium plants of short-term construction built during 1958-60. But the efficiency of the new plant seemed limited, in the first case by the advanced standards and high import content of the output, and in the second case by the conspicuous absence of technical and economic standards. A large part of the increase in output during this period was obtained by extending the utilization of existing plant to unsound limits, resulting in excessive plant deterioration and in a serious overexploitation of developed timber and mining resources. The industrial growth of this period also disclosed a massive imbalance in its extreme development of basic industries—coal, steel, power, and rail transport—and of highly advanced industries, while omitting a linking industrial infrastructure required to consolidate the former and support the latter.

Little new plant was added during the readjustment. Capital construction expenditures were sharply reduced, and directed toward

major plant maintenance and repair, redevelopment of timber and mining resources, industries of strategic interest which contribute insignificantly to output, such as petroleum, and industrial research for developing the missing industrial infrastructure.

Capital construction expenditures rose sharply in the 1964-65 upsurge, financed by marked increases in industrial profits and supported by initial technical successes in design and the organization of industrial resources. Some unfinished projects from 1960 have been completed, the motor vehicle and tractor plants restored to operation, and some notable developments observed in the chemical and other industries. But perhaps the most important development has been the reconstruction and renovation of existing plant which has permitted a greater variety of output in qualities, shapes, and sizes and in the kinds of goods produced.

While capital construction appears to have recovered the 1957 level, industrial capital construction remains much below that level. Table V offers a projection of capital construction expenditures, which makes no claim for precision other than to argue that the current increased emphasis in investment on agriculture, the military, and industrial research must necessarily have been at the expense of industrial plant construction. If we obtain a value for industrial plant by capitalizing output at a 3:1 ratio, industrial plant construction exceeded 10 percent of the value of industrial plant in 1957 but less than 5 percent in 1965.

THE THIRD FIVE-YEAR PLAN

Emigrants who claim to have been privy to Party briefings have reported that the annual industrial growth has been projected in the Third Five-Year Plan at 5 to 7 percent. While the credibility of these reports is uncertain, they are consistent with the present policies and posture. These growth rates would match industrial plant construction, even if it is increased somewhat. Moreover, one of Peking's top planners has stated the intention to hold the urban population at 110 million for the indefinite future, but presumably through the Third Five-Year Plan. In this case, industrial labor policy might reasonably be presumed to project annual increases in industrial employment of perhaps 2 to 3 percent combined with increases in industrial labor productivity of 3 to 4 percent.

This growth rate is also consistent with discussions of industrial policy in the Chinese press which seem to argue that technical and organizational change, rather than plant expansion, will constitute the major influences on industry in the immediate future. Industry, like other sectors, has its own revolution to complete in the Third Five-Year Plan. It is argued that industry has reached a stage of development where the complete vertical integration of output in individual plants has become obsolete and inefficient, requiring instead increasing plant specialization and interchange of products, and involving quality control and standardization of products. When this process is sufficiently advanced, it is argued, it will secure a marked increase in industrial efficiency and productivity. But to promote this process, it will be necessary to permit some industrial slack and to maintain adequate inventories, or otherwise individual plant managers will resort

to inventory hoarding or subsidiary parts production to assure fulfillment of plant targets. These arguments suggest a deliberate intent to restrain the rate of industrial growth over the Third Five-Year Plan.

INNOVATION AND CHANGE

Economic progress, while measured in the growth of material product, involves in its essence changes in social customs, organization, and modes of production. Two major sources of technical innovation lie in borrowing from abroad through foreign economic relations and developing internal capacities through an expanded education system. But these measures are only the means by which new technologies are made available. Beyond them lies the politics of development, which shapes social attitudes and organization and determines the speed and efficiency with which the new technologies can be adopted.

A contradiction quickly develops, for if the adoption of new technologies requires social change, the development of their efficiencies requires a stable environment. This problem has been the major root of a deepening political dissension over the past 17 years within the Chinese Communist leadership, reflected in the 1954 purge, the 1957-100 flowers campaign, the 1959 rightist purge, and the 1961-62 relaxation.

The dominant view, expressed by Mao, has been that China, with its high sights, must place an extreme emphasis on social change, or permanent revolution, pushing social change to the limits of stability and then pausing only long enough to allow society to catch its breath and to determine new revolutionary targets. The lever of change is one well-knit, centrally controlled party, and the appropriate cultural environment is one that praises the political activist and damns the technician, who by his innate, villainous bent seeks stable systems and means to stop the revolution.

Mao's policy secured the very rapid economic growth in the 1950's, although it left in its wake increasing social strains and economic waste. It has not yet been relevant in the 1960's, for during 1961-65 social instability was too close to the surface to risk its renewal, at least in sufficient force to make a serious impact. The Third Five-Year Plan, with its heavy emphasis on technical innovation and developing the efficiencies of the new technologies, is not one that provides a central role for the political "activist." Indeed, the issue troubling China's leaders in 1966 seems to be the question of whether Mao's policy has outlived its usefulness, whether "permanent revolution" is not a fiction, and whether societies which have initiated change must pause long enough to consolidate that change before pushing out in new directions.

FOREIGN ECONOMIC RELATIONS

Communist China was aware from its beginning of the importance of foreign economic relations to economic growth, and initially hoped for extensive economic aid from the U.S.S.R. Although the U.S.S.R. extended some economic and military credits in the early years, China discovered in the lengthy negotiations over assistance to the First Five-Year Plan (which ended in May 1953 without the ordinary diplomatic civilities) that the U.S.S.R. would assist in its development only within the limits of ordinary trade relations. Mao accepted these terms:

curtly in September 1953, and in November 1953 announced the "general line" under which China began a collective mobilization of resources to meet Soviet terms and maintain its industrial targets.

China successfully mobilized its resources and the U.S.S.R. opened its markets to Chinese exports, permitting a rapid growth in China's trade and external support for its industrial growth. China's average annual imports rose from US\$1.2 billion during 1952-54 to US\$1.5 billion in 1955-57 and to US\$2.0 billion in 1958-60. Machinery, equipment, and industrial raw materials comprised nearly 90 percent of these imports, and provided powerful support to industrial growth in the 1950's.

Chinese trade contracted sharply in the "readjustment" of 1961-63 with the shrinkage of agricultural exports, although it secured a substantial recovery in the 1964-65 "upsurge." After substantially retiring the Soviet debt in 1964, China secured, in particular, a marked recovery of its imports in 1965. Annual imports which had dropped to an average of US\$1.3 billion during 1961-64 rose to US\$1.85 billion in 1965. But in the 1960's imports in support of agriculture—grain, sugar, chemical fertilizers—have comprised nearly half of total imports, while imports in support of industry have remained below the levels existing at the start of China's planned development, and even in 1965 were only half the 1958-60 level.

The Third Five-Year Plan policy and outlook for trade is complex. Trade can be expected to expand, although not at 1964-65 rates, and could finance average annual imports approaching US\$2.5 billion. With some reduction in imports in support of agriculture, imports in support of industry could double and sustain the 1958-60 level. Chinese trade officials dangle this prospect before Japanese and West European traders, and it is credible because the upgrading of Chinese industry, although having an autarkic aim, is likely in the short run to increase rather than diminish import requirements.

But China's "world view" and efforts to persuade "third world" countries to cut their economic ties with capitalist countries impose certain limits on trade policies. It is bad enough that nearly 70 percent of China's trade in 1959 was with Socialist countries and nearly 70 percent with the non-Communist world in 1965, or that the capitalist countries of Japan, Canada, Australia, and Western Europe supplied the major share of China's imports in 1965. For China has an image to protect. China's international credit standing is judged sufficiently strong to command upward of US\$1 billion in medium- and long-term credits, but it has made no effort to tap this source, for to do so would be fatal to its image. Again, it has spread its purchases among many countries to reduce the appearance of dependence on any, and although it has explored large contracts, it has not completed any, dropping them as soon as they drew international attention and controversy.

A certain ambivalence then exists between the political and economic aims of foreign policy, suggesting it will be difficult to achieve projected industrial imports under the political inhibitions that seem to exist or without damage to the political image Peking attempts to project. There is some hint that a foreign policy debate occurred in the Chinese leadership in early 1966, in which one group argued that recent diplomatic failures and economic needs dictated a moderation

and retreat in foreign policy posture, while the opposing group argued a need for steadfastness, noting the large investment in foreign aid commitments, deliveries on which reached nearly \$200 million in 1965, and the likelihood that a foreign policy relaxation at the present time would fatally compromise Peking's hopes to establish itself as an alternative to Moscow as a center for world revolution. Thus, the stability and direction of China's foreign economic relations remain uncertain.

EDUCATION

China carried out in the 1950's a huge education program which by its size tended to become irrelevant. Table IV shows how the abnormal retention of students in the education program in its first decade limited the number released to society. Those released consisted largely of 6th year graduates who could not afford or could not qualify for further education. A cynic might argue that Peking in this period saw education as a convenient device for placing intellectuals of distrusted backgrounds in nonpolicy posts, and regarded the product of education primarily as indoctrination and the acquisition of social acclaim for the lavish distribution of social status IOU's.

Peking expected more from education than this, but the fact remains that economic progress in the 1950's did not wait on formal education. The expanding enterprises and bureaucracies drew on the educational rejects, the lower urban classes, and rural migrants, and improved the skills of these recruits with on-the-job training and spare-time literacy classes. The higher levels of the party, government, and state enterprises, too, were organized in military fashion in which command experience, rather than staff work or training, qualified one for leadership. The organizations were so structured that, although academic skills were sought, they were generally placed in staff positions, and that, whether technical expertise was available or not, prompt decisions could be taken.

This system worked well through most of the 1950's. It may be suggested that, in the lower ranks, the morale of self-made men who had elevated themselves from the lower levels of society was more effective than academic skills in improving productivity and effectiveness.

Again, since the economic task in China through most of the 1950's was one of rehabilitation or of implementing the technical directions of the Soviets, the ability to command in the higher ranks was far more important than technical expertise in mobilizing economic growth. But this force was badly defeated in the 1958-60 "Great Leap," when the economic battle plan was impossibly ambitious, strategically defective, and depended so heavily on technical choices and decisions.

In the 1960's the social orientation has perhaps been more impressive than the economic dislocations. Urban employment contracted sharply, governed generally by the seniority principle in which those entering the urban labor force after 1958 were returned to agricultural employment. The morale of the retained labor force was nevertheless greatly impaired; not only had the promotion prospects of the 1950's disappeared, but job security was now in doubt, particularly with the limited and defective qualifications of many of the workers.

With the urban labor force stabilized at perhaps 50 million, the education system, designed to support an urban labor force roughly twice that large, began to pour out its graduates. While the education system released to society only 3.3 million secondary and higher education graduates in the 10 years to 1960, in the following 6 years it released about 23 million. While some have entered the urban labor force, increasing the displacement of existing workers, the bulk have not. The Chinese leadership has elected to protect the existing urban labor force, and to place the burden of adjustment on the new graduates, who in their youth are presumably better able to adjust.

The data are too confused to trace precisely the destinations of the new graduates. A large number have been assigned to agricultural communes, particularly those with farm backgrounds. A large number of urban youth have refused assignment, and are being supported by their parents with supplementary odd-job earnings. The Government has set up a large number of CCC-type organizations to employ the new graduates, including large, national enterprises such as the Sinkiang Farm Production Corps and smaller ones managed by local governments. All of these solutions are stopgap in nature, and they cannot conceal that the visions of opportunities opened by the progress of the 1950's have now disappeared from Chinese society.

SUMMARY REFLECTIONS

The Third Five-Year Plan aims were evidently laid down by Mao, but their implementing provisions were drawn up by the planners. These provisions focus on the small corps of highly trained technicians, many of whom were trained in the pre-Communist period, most of whom were mistreated or denigrated in the 1950's, but who now have an opportunity to regain status and prestige. These measures also shift the spotlight from the political activist, but it may be suspected that many of these persons, from past defeats, welcome a respite from leading social change for the lesser task of maintaining order and stability. The Plan may have revolutionary aims, but it is to be implemented by nonrevolutionary means, which were probably welcomed by those participating in the planning.

This planning, however, ignored the pressures and ferment from the rising numbers of the newly educated generation. It may be suggested that the present Chinese leaders intellectually articulated communism in their student days and in their early struggle in the wilderness, while their lieutenants and followers since then have had a more pragmatic than intellectual commitment to the cause. The Yen-an supporters, now high in the Party, saw doctrine as an expression of agrarian distrust of the urban establishment, while the adherents since 1949 have merely accepted the growing power and promise of China as a reflection of doctrine. The new student generation, through their schooling, appears to be the first to show an intellectual rearticulation of communism, which differs importantly from that of the leaders. The leaders saw the promise of communism in its acquisition of power, with its subsequent promise of an improving quality of life too distant to be relevant except for propaganda value. In contrast, the new student generation sees Communist power as essentially attained and places more importance on the responsibility of communism to improve the quality of life.

But despite or because of this, the new student generation pins its hopes on Mao, who is regarded as motivated by doctrinal principle and as an exponent of social change. This group instinctively feels that, if anyone can get the country moving again, it will be Mao. The new student generation knows that a socialist society does not permit unemployment or malplacement of talent, and their gross manifestation in Chinese society today indicates that someone has betrayed the revolution. Their suspicion centers on lower officials, who are regarded as ideological illiterates and mere holders of power through seniority and faithful service.

It is thus ironic, but understandable, that Mao should be able to harness the discontent of the students in Red Guard units, and turn their fury on teachers, principals, party headquarters in city, province, and region, and on affluent citizens—in short, all who have gained position in present Chinese society now wrongfully denied to the students. But what is Mao's purpose? It could hardly be a limited one, such as a tactical step to consolidate leadership changes or a temporary release for pent-up student discontent, for the forces it has released will be difficult to tamp down. It must be viewed as the start of a major campaign of national import.

The signs are that Mao intends to bring the new student generation into line, not by meeting their aspirations, but by educational reforms which will indoctrinate students to accept their lot and by imposing on the rest of society a vast austerity under which the relative disadvantages confronting the student generation will be reduced and made more tolerable. This new leveling of society presumably is to be secured by threatening the bureaucratic establishment with purges and the replacement of dissidents by drawing on the new student generation. A new egalitarianism, Mao hopes, will reestablish the revolutionary fervor of the 1950's into Chinese society. Mao firmly believes that a demoralized army is restored to effectiveness by marching the troops, not by granting them favors.

But Mao's program is challenging vested interests in the existing bureaucratic establishment, and it is being resisted on the grounds that it is upsetting production and undermining the incentives and mechanisms underlying the Third Five-Year Plan. It may later, but not yet, face a sense of betrayal from the new student generation, which will not have gained its objectives. The political evaluation of the future is thus uncertain.

Mao's program aims at establishing a political stability under which the Third Five-Year Plan can be more effectively pursued. If Mao fails, the weakened political structure and the rising sense of strength and identity in the new student generation may force changes in the Third Five-Year Plan to meet domestic social needs. A withdrawal of investment resources from industrial research and the military program which would be reallocated to agriculture and to small-scale, labor-intensive industry could renew urban growth and begin to reduce the backlog of unemployment in the new student generation. Such a program would restore normality to China's economic development, abandoning the present irrational effort to leapfrog into the company of advanced industrial nations. But it would be a step forced by political necessity, and not one which would be welcomed by China's present leaders.

TABLE I.—Model of China's population growth¹

Midyear	Life expectancy (years)	Number of women, aged 15 to 44 (millions)	Annual births per 1,000 women, aged 15 to 44	Population (millions)			
				0 to 14	15 to 59	Over 59	Total
1948				181	317	37	535
1953	40.0	119	196	209	331	43	583
1958	50.0	124	200	254	351	49	654
1963	40.0	130	176	270	368	52	690
1968	50.0	142	195	298	412	58	768
1973	52.5	163	173	319	466	64	849
1978	55.0	184	145	343	510	72	925

Age group	Absolute increase (millions)		Percentage increase	
	1948-63	1963-78	1948-63	1963-78
0 to 14	89	73	51	26
15 to 59	51	142	15	39
Over 59	15	20	35	44
Total	155	235	29	34

¹ This model ages and reverse-ages the 1953 census population, employing U.N. life table values and assuming life expectancies and fertilities appropriate to obtain the total population estimated or projected by Peking.

TABLE II.—Estimates of grain output

Year	Crop weather	Population (millions)	Official estimate (millions of tons)	O. L. Dawson's estimate ¹	
				Output (millions of tons)	Per capita (kilograms)
Pre-1949 peak		530	138.7	170	320
1949	Poor	545	108.1	150	275
1952	Good	575	154.4	170	296
1953	Average	588	156.9	166	284
1954	Poor	602	160.5	170	282
1955	Good	615	174.8	185	301
1956	Poor	630	182.5	175-180	278-286
1957	Average	645	185.0	185	287
1958	Good	659	250.0	204	310
1959	Average	669	270.0	170	254
1960	Poor	676	150.0	160	237
1961	do	680	162.0	170	250
1962	Good	687	174.0	180	262
1963	Average	697	183.0	185	265
1964	Good	712	200.0	195	274
1965	Average	728	200.0	193-200	265-275
1970 (plan)		810	243.0		

¹ Estimates of the former U.S. agricultural attaché in China.

NOTE ON 1958-70 OFFICIAL ESTIMATES.—The 1958 and 1959 official estimates are exaggerated Great Leap claims, which are not taken seriously. Since 1960 Peking has not published grain output estimates in the domestic press, but Peking officials have discussed the estimates with foreigners. Mao told Viscount Montgomery in September 1961 that the 1960 output had been 150,000,000 tons, and that the preliminary estimate for 1961 was 160,000,000 tons. In April 1963 Chou En-lai told a Dawn (Pakistan) reporter that the grain output increase in both 1961 and 1962 had exceeded 10,000,000 tons, and an emigrant sourced mentioned a 1962 estimate of 174,000,000 tons. At the end of 1964, Edgar Snow was given an estimate for 1964 of 200,000,000 tons and a percentage increase which placed the 1963 estimate at 183,000,000 tons. In 1966 several Peking officials stated that the 1965 output had been 200,000,000 tons, remaining at the 1964 level. The 1970 plan target is estimated on the basis of a stated intention to reach satisfactory levels of per capita grain output, which is assumed to mean the conventional standard of 300 kilograms per capita for an expected population of 810,000,000.

TABLE III.—Estimated crop acreage, yields, output

	1952	1957	1961	1965
Acreage (million hectares):				
Farmland.....	109.9	111.8	106.7	109.0
Multiple crop index.....	134.0	140.6	133.0	143.1
Sown acreage.....	147.3	157.2	142.2	156.0
Food grain crops.....	116.3	120.9	120.0	125.0
Rice.....	30.0	32.2	30.0	33.0
Wheat.....	25.0	27.5	22.0	24.0
Miscellaneous grain.....	51.3	50.6	54.0	55.0
Tubers.....	10.0	10.5	14.0	13.0
Soybeans.....	11.7	12.7	7.0	9.0
Oilseeds (peanut, rape, sesame).....	4.7	5.8	3.5	4.5
Cotton.....	5.6	5.8	3.5	4.8
Other technical crops.....	.8	1.1	.5	1.0
Other:				
Green manure.....	2.7	3.2	2.5	5.3
Fodder, vegetables, etc.....	5.5	7.7	5.2	6.4
Yields (metric tons per hectare):				
Rice.....	2.62	2.692	2.50	2.96
Wheat.....	.8	.855	.70	.85
Miscellaneous grain.....	1.0	1.042	.87	1.00
Tubers.....	2.0	2.085	1.75	2.05
Soybeans.....	.82	.79	.79	.83
Oilseeds.....	.79	.65	.65	.75
Cotton.....	.234	.284	.257	.292
Output (million metric tons):				
Rice.....	78.6	86.8	75.0	97.8
Wheat.....	20.0	23.7	15.4	20.4
Miscellaneous grain.....	51.3	52.7	47.0	55.0
Tubers.....	20.0	21.9	24.5	26.7
Total food grain output.....	170.0	185.0	162.0	200.0
Soybeans.....	9.5	10.05	5.5	7.5
Oilseeds.....	3.7	3.8	2.3	3.4
Cotton.....	1.3	1.64	.9	1.4

NOTE.—In constructing this table, official data are used for 1957 and for oil, technical, and green manure crops in 1952. The 1952 food crop estimates have been adjusted upward to match Dawson's output estimate and 1952 miscellaneous crop acreages are also adjusted upward to account for probable underreporting. The 1961 and 1965 farmland estimates have been described earlier, and sown acreages are the sum of individual crop acreage estimates. The derived multiple crop index reasonably reflects the rural disruption of 1961 and the substantial recovery by 1965.

The 1961 and 1965 food crop estimates comprise a model incorporating bits of official information, including (1) total output estimates (see above), (2) rice acreage and yield increases contributed 60 percent of the 1961-65 food crop output increase (Jen-min Jih-pao, Jan. 16, 1966), (3) miscellaneous grain and tuber acreage had increased "in recent years" (presumably over 1957 levels) and in 1965 was just over twice that of rice and just under 3 times that of wheat (Jen-min Jih-pao, Feb. 6, 1966), and (4) 1965 yields of wheat, miscellaneous grains and tubers "remain low" (presumably not over 1957 levels) (Kuang-ming Jih-pao, Nov. 16, 1965; Jen-min Jih-pao, Feb. 6, 1966). In addition, the 1961 rice and wheat acreages can be roughly estimated from scattered provincial reports, while the increase in miscellaneous grain and tuber acreage in 1961 is consistent with local information and the maintenance of total food crop acreage in 1961 is reasonable view of extensive acreage shifts from other crops and the evidence that the decline in yields was sufficiently marked to account for the drop in output. In 1961, the decline in rice yields was less than for other crops, both because it is an irrigated crop and because the 1961 drought was centered in the wheat region.

The soybean and oilseed estimates are rough. In 1961, substantial acreage shifts to food crops occurred, with a cessation of oilseed exports and severe domestic shortages of edible oils. A substantial recovery has occurred by 1965, but both exports and domestic supply seem to be significantly below 1957 levels. Emigrant sources suggest that cotton output reached a low point in 1962, with an output of 850,000 tons on 3,300,000 hectares. Subsequent recovery has been rapid. However, official claims admit limited acreages, for state grain is no longer being distributed to cotton-growing areas (as in the late 1950's) and these areas must limit cotton acreage to assure their grain supplies. However, phenomenal increases in cotton yields are being claimed, leading to the claim of a record output in 1965 (Kuang-ming Jih-pao, Feb. 14, 1966). However, the yield and output claims seem inconsistent with supply indications and continuing policies, and are not accepted in this estimate. Other technical crops (tobacco, sugar, etc.) have recovered sharply. Green manure acreage has been expanded sharply in the past few years to support the growth in rice output, with 1965 acreage reported at 5,300,000 hectares, and increases claimed in individual provinces suggesting a 1966 total of 7,300,000 hectares. Miscellaneous crop acreage, comprised primarily of fodder crops, has been roughly estimated on the basis of indicated livestock numbers.

TABLE IV.—*Educational estimates*

[In millions]

Year	Enrollment			Enrollment: Percent of population		
	Primary	Secondary	Higher education	Primary	Secondary	Higher education
1949-50.....	24.4	1.27	0.117	4.5	0.23	0.021
1952-53.....	51.1	3.13	.191	8.9	.54	.033
1957-58.....	64.3	7.06	.441	10.0	1.09	.068
1958-59.....	86.4	9.99	.660	13.1	1.52	.100
1959-60.....	90.0	12.9	.81	13.5	1.93	.121
1960-61.....	85.0	15.0	.90	12.6	2.22	.133
1961-62.....	76.0	13.1	.85	11.2	1.93	.125
1962-63.....	73.0	12.0	.75	10.6	1.75	.100
1963-64.....	76.0	11.5	.68	10.9	1.65	.098
1964-65.....	80.0	12.5	.70	11.2	1.75	.098

	1st decade, 1949-50 to 1958-59	Next 6 years, 1959- 60 to 1964-65
Primary (6th year) graduates.....	32.0	53.0
Deduct:		
Increased secondary, higher education enrollment.....	-12.3	+ .4
Increased teaching staff, all levels.....	-1.7	- .4
Students leaving education system to enter society at 6th and higher grades.....	18.0	53.0
Approximate composition:		
Primary level.....	14.7	30.0
Secondary level.....	3.0	22.0
Higher education.....	.3	1.0

TABLE V.—*Index of estimated industrial growth*

1952.....	48
1957.....	100
1960, 1st half.....	200
1962.....	110-120
1965.....	140-150

TABLE VI.—*Gross national product projections, 1957 and 1965*

[Billions of U.S. dollars]

By origin	1957	1965	Remarks
Agriculture.....	31.1	33.7	Increase of 8 percent.
Industry, construction, transport.....	17.4	21.5	Increase of 24 percent.
Trade, services.....	16.5	18.1	Increase of 10 percent.
Total.....	65.0	73.3	
Total per capita (dollars).....	101.0	101.0	
By end-use:			
Consumption.....	50.9	59.1	
Private.....	44.2	50.0	Unchanged per capita.
Government.....	3.0	4.0	
Defense.....	3.7	5.1	Current (budgetary) expenditure up from 5.7 percent to 7 percent of GNP.
Investment.....	14.1	14.2	
Fixed:			
Agriculture.....	2.0	3.0	
Military.....	1.0	2.0	
Industry:			
R. & D.....	.3	1.0	
Production.....	4.3	2.2	
Other.....	2.5	2.0	
Inventory and foreign balance.....	4.0	3.5	
Total.....	65.0	73.3	

NOTE.—These projections are not based on independent data, but are merely intended to show a numerical expression of, and a logical consistency among, the various estimates made in the text.

PLANNING, MANAGEMENT, AND ECONOMIC
DEVELOPMENT IN COMMUNIST CHINA

BY

YUAN-LI WU

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PLANNING, MANAGEMENT, AND ECONOMIC DEVELOPMENT IN COMMUNIST CHINA

INTRODUCTION

Until the collapse of the Great Leap Forward in 1960, Communist Chinese leaders frequently pointed to the reportedly high rate of China's economic growth, particularly that of the industrial sector, as evidence of the superiority of the Chinese model of economic planning. The Chinese experience was held up as a suitable example for other less developed countries in Asia, Africa, and even Latin America that desire rapid industrialization to emulate. While China's economic troubles in the early 1960's made the Chinese claim appear irrelevant, the successful Chinese nuclear tests since 1964 have again raised the issue of Communist China's economic potential under her system of planning and management. A reevaluation of the system is needed in order to determine both its performance in the past and its inherent properties which may bear upon the course of Communist China's future economic development.

The First Five Year Plan covered the period of 1953-57. The Second Five-Year Plan (1958-62) coincided with the Great Leap, which ended ignominiously in 1960 although official reports would indicate that many of the production targets of the plan had already been reached by then. Officially, the period from 1961 through 1965 was designated as one of readjustment and consolidation, while it actually consisted of a major depression spanning approximately from the latter part of 1960 through the first half of 1962, followed by gradual recovery. The Third Five-Year Plan is scheduled for 1966-70. Thus there are two complete 5-year plan periods from which we may expect to derive at least some tentative conclusions.

In the following pages we shall first examine what the national economic plan consists of and how it is formulated. The central focus in this first section will be the content of the plan, the structure of the Government agencies involved in its formulation, implementation, and evaluation, and the manner in which crucial decisions are supposed to be reached and carried out.

The discussion will, however, deal with planning in the abstract. Reality and the plan do not necessarily coincide. Nor is reality always accurately perceived. These discrepancies occur for a variety of reasons. A historical one consists of the chronological development of the apparatus and of the data base needed in the planning. During the entire Communist period from 1949 to date, as we shall see, partial rather than comprehensive planning has been the rule. But there are a number of other important reasons.

Discrepancies between planned development in theory and actual events often arise because the information on which the plan is based does not correspond to reality. A second reason is the possibility that

while a plan may be initially quite realistic, it is changed after its initial formulation. Still a third reason is disregard of the rules and instructions in practice even though officially the plan remains in force. Such deviations in practice may take place at different levels of the enterprises and agencies in charge of plan implementation. Section II of this paper will be devoted to a discussion of these and other factors accounting for the discrepancies.

Because of the relatively short period during which economic planning has prevailed, information on the behavior of Communist Chinese planners and managers can be deduced only with considerable uncertainty as to its future relevance. But even on the basis of the limited time period for which data are available, it is possible to discern certain elements that seem to constitute a pattern. The possibility that these elements may continue to be effective lies in the apparently ideological and political roots of the behavior they portray. Discussion of this "behavioral pattern" is contained in section III.

If the analysis is correct with respect to the behavioral pattern, we should be able to project one or more alternative courses of economic development for Communist China in the foreseeable future. The final section of this paper attempts to set forth some of the key variables involved. To a degree both the factors inherent in the behavioral pattern and those which are characteristic of the Chinese economic structure at its present stage of development can be discerned. While prognosis may be difficult, the interested observer can at least know what particular events and tendencies to watch.

I. THE NATIONAL ECONOMIC PLAN AND ITS FORMULATION AND IMPLEMENTATION

THE SCOPE OF THE PLAN

The national economic plan which theoretically governs all Chinese economic activities is composed of a set of component plans that provide the basis of achieving balance between the supply and demand of materials, labor, and financing, both nationally and on the regional level. At the national level, plans for the materials and labor balance rest on still other partial plans which may be conveniently subdivided into 12 categories or aspects as enumerated below;¹ the regional plans are essentially the same as the national plan. The student of Soviet economic planning will not fail to note the essential similarity of the Soviet and Chinese planning systems, which is not surprising.

- (1) Industrial production;
- (2) Agricultural production;
- (3) Transportation;
- (4) Labor and employment;
- (5) Allocation of materials;
- (6) Commodity flow;
- (7) Projects of capital construction;
- (8) Social, cultural, and welfare undertakings (including public utilities, housing, health, and cultural and educational activities under which are included the training of the Communist Party activists);

¹ See Yuan-H Wu, *The Economy of Communist China, an Introduction*, ch. II, Praeger, 1965.

- (9) Foreign trade;
- (10) Technological development;
- (11) Production costs; and
- (12) Commodity prices.

Of the 12 sectoral or partial plans, items 1, 2, and 3 deal with the output plans of individual sectors for which production targets, quota allocations to individual enterprises, and methods of production and technical norms are given. Items 4 and 5 are concerned with the allocation of labor and material inputs consistent with the preceding production and transportation plans. Item 6 deals principally with the distribution of final products for consumption. Items 7 and 8 are concerned respectively both with the allocation of resources to investment and collective consumption as end uses and with their specific commodity and project contents. The foreign trade plan deals with commodity trade and other balance-of-payments items involving foreign exchange. The technological plan has for its purpose the preparation of programs to provide Communist China with the latest scientific and technological information, including information from abroad. The cost plan specifies standard costs, as well as targets of cost reduction and projected changes in labor productivity and money wages. It is closely related to the plan of commodity prices; together they are instrumental in regulating the accumulation of capital—inasmuch as profit from State enterprises is a major source of Government revenue—and in encouraging increase in efficiency in production. The cost plan serves therefore not only as an important part of the national plan in resource allocation, but, supplemented by technical targets in the other plans, it also provides guidelines for the management of individual enterprises so that decisions and operations at the enterprise level would contribute to the fulfillment of the national plan as a whole.

At the national level, the financial plan consists of four parts:² the consolidated State budget, the credit and cash plans of the banking system, the financial plans of the ministries and their subordinate organs, enterprises and communes, and the estimated receipts and expenditures of Government agencies and enterprises outside the regular budget. Government control of incomes and expenditures under this set of plans is an indispensable tool in regulating the allocation of resources between consumption and investment and in maintaining price stability. Very rigorous control over the supply of money in the hands of the public, first instituted in 1950, was a major measure in combating the hyperinflation that was not completely suppressed until 1951. An effort has been made to maintain the same degree of "cash control" since then although performance has not always been up to par, especially during the early sixties and, to a lesser extent, in 1956.

PLAN AND MANAGEMENT IN THE INDIVIDUAL ENTERPRISE

At the operational level, the nature of the annual plan of the individual enterprise is aptly described by its title, i.e., the "plan of production, technique, and finance."³ In general, it includes within

² See Richard Diau, *Communist China's Financial Planning in National Economy and Industry* (in Chinese), Hong Kong, Union Research Institute, 1966.

³ *Ibid.*

a section on production the quantitative and qualitative specifications of products, technical coefficients, the degree of utilization of equipment, and production schedules. In the part dealing with labor, the production plan specifies both manpower and work quotas, together with working hours, wage rates, personnel classifications, and labor welfare provisions. A separate part deals with the supply of raw materials, rates of their consumption, supply schedules and sources, and working capital requirements. Another part is concerned with the maintenance and repair of equipment and specifies schedules for major repairs and periodic inspections. A final component of the production plan deals with unit costs and the allowability of various costs in the "economic accounting" of the enterprise.

Parallel to the above production plan are three other parts dealing respectively with the sale and distribution of products, the technological requirements and improvements envisaged for the particular enterprise, and the financial receipts and expenditures of the enterprise corresponding to its level of activities and the specified cost coefficients. A series of statistical tables and budgetary schedules accompany these plans and form the basis upon which performance of the enterprise is scrutinized by the disbursing agents and auditors in the banking system.

The management of an enterprise is instructed to observe the targets and standards laid down in these detailed plans after they have been approved by the state economic commission. As an independent "economic accounting unit" the enterprise is required to deliver a planned profit calculated over costs, which do not, however, take interest charges into full account, with reward and punishment tied to the level of performance. In theory, the management of an enterprise is encouraged to overfulfill any part of the plan provided the other parts are not adversely affected. In practice, because of possible inconsistency between individual planned targets, the plan of an enterprise does not necessarily offer an unequivocal guide to operation.

THE APPARATUS OF DATA COLLECTION, PLANNING AND PLAN IMPLEMENTATION

The national economic plan and its many components are formulated and implemented by a complex and ponderous set of Government agencies.⁴ These may be described under the following headings:

1. *Information gathering.* Data for planning are supplied by the State Bureau of Statistics. Established in 1952, the bureau developed during the subsequent 4 years a network of 160 offices and one-quarter million statistical reporting units at different levels of government. The number was expanded further during the Great Leap Forward.

2. *Planning.* Until May 1956, the responsibility for formulating both the long-term and the annual economic plans was lodged in the State Planning Commission, also established in 1952. In 1956, a new State Economic Commission was put in charge of the annual economic plan. Individual departments within the two Commissions are responsible for the component plans. A separate State Construction Commission also existed from 1954 to 1958 when it was incorporated

⁴ See footnote 1, p. 100.

into the State Planning Commission. A State Capital Construction Commission, which maintained a parallel existence for 3 years from 1958 and was responsible for long-term investment projects, and was incorporated into the State Planning Commission in 1961. In 1965 it was again separated from the State Planning Commission.

3. *Control of inputs.* Several agencies supervise the allocation of labor and materials. Allocation of labor is in the hands of the Ministry of Labor and, in the case of penal and forced labor, the Ministry of Public Security. A Bureau of Foreign Experts and the education ministries also form an integral part of the mechanism regulating labor supply. A bureau for allocating the supply of materials was first established in 1956 and, after incorporation into the State Economic Commission during 1958-63, was again put under the direct control of the State Council in the latter year where it has remained.

4. *Production.* An integral part of the apparatus of plan formulation consists of the "production" or "industrial branch" industries which oversee the operation of the various government enterprises in their respective commodity groups. At the national level, the number of these ministries increased from 12 in 1952 to 24 in 1956 and 25 in 1965, reflecting a process of broadening of coverage within the plan, re-grouping for administrative purposes, and increasing specialization as a result of industrial development. As of the beginning of 1965, following the first session of the Third National People's Congress, the 25 such production ministries were in charge of—

- (1) Textiles,
- (2) Light industries (two ministries numbered first and second),
- (3) Chemicals,
- (4) Construction engineering,
- (5) Building materials,
- (6) Machine manufacturing (eight ministries numbered first through eighth), including the manufacture of various categories of arms, both nuclear and conventional,
- (7) Petroleum,
- (8) Coal,
- (9) Agriculture,
- (10) State farms and land reclamation,
- (11) Marine products,
- (12) Forestry,
- (13) Water conservation and electric power,
- (14) Railroads,
- (15) Communications,
- (16) Post and telecommunications, and
- (17) Ocean transport.

The Capital Construction Commission noted earlier which oversees plant construction and the installation of machines and equipment may also be regarded as a component of the executive and production control apparatus.

5. *Trade and distribution.* The domestic distribution channels are under the control of the Ministries of Food and Commerce, and, indirectly, influenced by the Ministry of Foreign Trade. The operational end is handled by 22 domestic state trading corporations, some

with affiliates in Hong Kong, and 10 specialized export-import corporations, supplemented by an external transport company and a ship leasing concern.

6. *Financial administration.* For the formulation and administration of the financial plans, the aid of several agencies and financial institutions is enlisted. These include the Ministry of Finance and the People's Bank of China, and, under their supervision, several specialized banks, a foreign exchange bank, a state insurance company, investment companies established to attract overseas Chinese investors, a large number of credit cooperatives, and a commission overseeing commodity prices.⁵ The principal function of these institutions is to regulate consumption expenditure in relation to savings, to provide finance for the planned expenditures required by the production plans, to preclude unauthorized disbursements and interagency credit arrangements not provided for in the production plans, and to maintain control over costs through financial checks.

7. *Technological change.* Another group of institutions which have begun to play an increasingly important role in Chinese economic development in recent years is headed by the Scientific and Technological Commission. Established in 1958, the Commission coordinates all scientific and technological programs of the many research institutes under the ministries, the universities and the Academy of Sciences. Its work in enhancing the degree of independence of Communist China in science and technology is a *sine qua non* of economic autarchy.

PLAN FORMULATION

In theory, plans are formulated by the planning agencies on the basis of data supplied by the State Statistical Bureau; they are then entrusted to the operating agencies for implementation. If all plans were realistic and faithfully carried out, the course of Chinese economic development would depend entirely upon the substantive nature of the plan as exemplified by the bill of goods included in final demand and the manner in which they are selected and incorporated into the national economic plan.

Schematically, the process of plan formulation begins with the issue of "control figures" by the State Economic Commission to the central government ministries and provincial governments for transmission to the enterprises and agencies under their respective jurisdictions. The "control figures" consist of a set of production targets, input and cost coefficients, and other relevant indicators of performance described under the component plans for the enterprises to follow. Some adjustments of the initial control figures may be made at this time. Operational plans, including both targets and requirements, are then formulated by the individual enterprises and submitted to higher levels. Before 1959, the individual plans were integrated by industrial branches at the level of the national ministry. Beginning with the 1959 annual plan, they were also to be integrated at the provincial or regional (for autonomous regions) level.⁶ Both the

⁵ The Communist Bank of China, which is the foreign exchange bank, is to be distinguished from the original Bank of China still operating under Nationalist Chinese control. The position of the overseas Chinese investment companies since the initiation of the Red Guards movement is not clear.

⁶ The decentralization plan of 1959 followed closely the Soviet decentralization program instituted earlier. There has been very little information about its fate since then.

industrial branch plans and the territorial plans are then reviewed by the State Economic Commission for revision and integration into a plan of material and labor balances. The revised control figures are then reissued as targets for the individual operating agencies and enterprises.

As mentioned elsewhere, the manner in which the initial control figures are selected have never been fully explained.⁷ We can deduce, however, at least some of the principal considerations which enter into the selection of some of the output targets. These include (1) minimum requirements of the population in the case of some basic consumer products, (2) full capacity output in industries where demand is far from being satisfied and shortage of equipment or other inputs constitutes a bottleneck, (3) maximum output of certain goods where the availability of imported material is a constraint, (4) material requirements of investment projects selected for their role in offsetting certain sectoral imbalances or in programs negotiated under foreign aid arrangements, (5) for some commodities, outputs that are somewhat larger than those of the preceding period, (6) in the case of some intermediate products, input requirements based on the above choices of final products, and (7) choices that are based on defense and other noneconomic considerations.

Of the above factors not the least important are the political preferences of the CCP which has within the party structure separate departments in charge of the affairs of (1) agriculture and forestry, (2) industry and communications, and (3) finance and trade. Some of the initial "control figures" issued by the State Economic Commission doubtless originate from the CCP central committee. In the ultimate analysis, decisions on the really important priorities, therefore, rest with the Communist Party. Since August 1965, each of the three corresponding economic administrative offices under the state council has added a political department, which has further strengthened the role of purely political decisions and of political supervision of the economic administrators.

II. SOURCES OF DISCREPANCY BETWEEN PLAN AND REALITY

POOR PLANNING AND INSTITUTIONAL AND MANAGEMENT PROBLEMS

The preceding section has described the structure of the national economic plan which theoretically provides for (1) intersectoral balance within an input-output matrix, (2) correspondence between the plan in real terms and its counterpart in terms of monetary flows, and (3) the steady growth of the entire system at predetermined rates. Actual experience since 1953 when the First Five-Year Plan made its official debut has, however, demonstrated both the recurrent emergence of sectoral disequilibrium at various levels and, since 1958, when the Second Five-Year Plan was ushered in by a Great Leap Forward, failure to achieve steady growth. There are many reasons why the idealized path of planned progress and actual experience do not coincide. One simple explanation is that some of the plans have been poorly conceived either as a result of the planning procedure and

⁷ Yuan-H Wu, *op. cit.*, 1965, ch. III.

system used or in consequence of the inexperience and technical inadequacy of the planning staff. For the first 4 years of the First Five-Year Plan, both types of shortcomings apparently prevailed.

In September 1956, when Communist China was about to embark upon the last phase of the 1953-57 Plan, the chairman of the State Planning Commission, Li Fu-ch'un, offered a candid appraisal of the Commission's performance.⁸ He noted that the Commission was at the time responsible both for long-term planning and for the formulation of the annual plan and that during a part of the time under review, it was also responsible for the administration of certain industries and capital investment undertakings. Thus, burdened by the chores of routine administration and the incessant drafting and revision of plans, it was unable to pay sufficient attention to the collection and appraisal of data, consideration of long-term national interests, and the determination of specific facts in detail. Inadequate attention to detail and to local conditions was also in part the result of a practice forced upon the central government ministries and the provincial authorities, as reported in a Hongkong study,⁹ because of their lack of time to prepare more realistic plans. Instead of waiting for the information contained in the plans prepared by the individual enterprises under their jurisdiction on the basis of "control figures" transmitted through their hands, as the proper procedure requires, the ministerial (i.e., industrial branch) and provincial authorities often made their decisions without the benefit of the operational plans of the basic units. Therefore, greater damage was done by inexperienced and/or unknowledgeable members of the planning staff than it might have been otherwise. Furthermore, according to Li, the Commission also suffered from undue concentration of decisionmaking and the consequent lack of flexibility to respond to new information received and to novel conditions. It was not possible, therefore, to arrive at intersectoral balance and to maintain it at all levels and in all regions. In short, there was incomplete, incorrect, inflexible, and shortsighted planning.

A no less simple reason accounting for discrepancy between the plan and actual performance is the fact that plans are sometimes disregarded. In the agricultural sector especially, the farmers in collective farms during 1956-57 and in communes since 1958 may not always have followed a predetermined course according to plan. Organizationally, with the exception of the greater part of 1958 and 1959, the Government authorities have never been in full control of agricultural production. This situation has apparently continued during the years of agricultural recovery from the ravages of the Great Leap since 1962, as evidenced by the continuation of debate on the scope of Government control of agricultural production in the communes.¹⁰ The point at issue is whether Government control should be limited to requisition of output through planned purchases and the agricultural tax or whether production should be carried out under a unified plan even though the fulfillment of the detailed plans might be supervised at the local

⁸ *Jen-min Jih-pao* (People's Daily), Peking, Sept. 25, 1956, report by Li Fu-ch'un.

⁹ Diau, *op. cit.*, p. 38.

¹⁰ See Wang Hsiang-ch'un, Chiang Hsing-wei, and Ch'en K'un-shiu, "Wo-kuo Nung-yeh Sheng-ch'an Kuan-li Wen-t'i" (On the Control of Agricultural Production), *Ching-chi Yen-chiu* (Economic Research), No. 3, Peking, March 1965, pp. 33-39.

level. There were plainly people who held opposite views on this matter up to the eve of the Third Five-Year Plan in 1965. The continued presence of collective ownership in the communes as opposed to state ownership which was originally intended in 1958-59 when the communes were first introduced has contributed to this difficulty.

In the nonagricultural sectors, state ownership and full control were not complete until 1956. Even after 1956, it may not always have been possible to observe all aspects of the national economic plan and of the "control figures" because of possible conflicts among different targets issued to the managements of individual enterprises which have been encouraged to overfulfill some of the targets. In general, both management and workers are encouraged to overfulfill production targets. Periodic interplant or interenterprise contests and campaigns to emulate national production record holders may play havoc to production costs. Where costs are noninclusive through the omission of interest charges on fixed capital, the result may be the most uneconomical use of certain scarce resources. The failure of the Great Leap was at least partly brought about by the emergence of bottlenecks in labor supply and transportation, especially at times of peak demand, such as the harvest season. Deteriorations in quality, again notable during the Great Leap, resulting, for instance, in the excessive output of coal and ores with above normal impurities, were also responsible for the emergence of some of the bottlenecks. Where emphasis on breaking output records is persistent, the management may choose to produce more of those products for which the targets can be more readily exceeded regardless of the demand. There have also been reports on such matters as misuse of short-term working capital in long-term investment, inclusion in cost of items which represent a part of the profit reserved for the enterprises, and general preoccupation with indicators rather than the substance of performance. Regionalism has also acted as a disruptive factor to the national balance of input and output while centralized balance of demand and supply at the ministerial level has often had the effect of creating unnecessary demand on the nation's transport capacity.

One can identify additional specific causes which can give rise to discrepancies between plans and reality and which have been operative during different periods up to this writing. In particular, the following five principal factors can be enumerated.

First, the national economic plan may be based upon information which is inaccurate. Second, even when the data used in initial planning correctly reflect reality, actual performance may result in either overfulfillment or underfulfillment of the initial plan. Such a result may lead to changes in subsequent plans or, if anticipated early, even to changes during the same planning period. Furthermore, there is the possibility that changes are made in a plan independently of any anticipated underfulfillment or overfulfillment. Where many such changes are made, especially if they are in the same direction, such as the successive upward revision of targets, the likelihood of divergence from reality increases. If this situation is a general one, the entire plan may be incapable of realization. If only some economic sectors are affected, the final result may depend upon how plans in other sectors are adjusted in response to the exigencies. Third,

plans may not be fulfilled because of exogenous shocks suffered by the economic system, or they may be overfulfilled because of unexpected "windfalls."

REASONS FOR INACCURATE OR INADEQUATE INFORMATION AVAILABLE TO CHINESE PLANNERS

There are good reasons to believe that Chinese planners have employed incorrect or inadequate information in their economic planning. In the first place, the coverage of the statistics collected has not been complete or consistent. Since the State Statistical Bureau was not established until October 1952, one would expect that a complete set of procedures for reporting and processing data could not be fully developed until quite some time after that date,¹¹ even if full coverage of all the units that should report had been possible from the very beginning. Actually, not all of the private enterprises were nationalized or brought under joint operation with the government until the end of 1956 when the First Five-Year Plan had nearly run its course. In regard to statistics on trade and distribution, the organization of co-operatives through mergers and the formation of large associations of entire trades were also not completed until 1956. The same situation applied to the many handicraft work shops which accounted for a large proportion of the manufacturing sector of the economy. It would seem to be axiomatic that the coverage of statistical reporting, as well as the accuracy of the reports, tends to suffer as the number of reporting units increases and the individual size of each unit decreases. This situation would seem to have prevailed before 1956 when the socialization of the industrial and trade sectors had not yet been fully carried out. It was also true in the case of agricultural statistics. According to Li Fu-ch'un in September 1956, "The State Planning Commission has in the past paid more attention to the state industrial enterprises of the Central Government, while inadequate attention has been given to industrial enterprises under the local governments, as well as agriculture, commerce, and cultural and educational undertakings."¹² This imbalance in emphasis not only betrayed a general preference to develop a few large industrial enterprises, but acted as both a cause and an effect of inadequate information on the neglected sectors.

As will be noted later, one particular effect of incomplete statistical coverage may have been an underestimate of stocks on hand during the first years of the First Five-Year Plan.¹³ This may have happened outside of a few principal commodities for which a more complete record may have been available. However, even in the case of ferrous, nonferrous, and scrap metals, as well as timber, all of which are important in construction and investment projects, inventory-taking at some of the principal centers was apparently not made until the end of 1954,¹⁴ thus effectively precluding any use of the findings even in

¹¹ This situation was acknowledged in the report by Hsüeh Mu-ch'iao, then Director of the State Statistical Bureau, on the first 2 years of the Bureau's operations. *T'ung-chi Kung-tso T'ung-hsün* (Statistical Bulletin), No. 1, Peking, January 1954, pp. 4-11.

¹² See footnote 8, p. 106.

¹³ *T'ung-chi Kung-tso T'ung-hsün* (Statistical Bulletin), No. 6, 1954, pp. 32-33.

¹⁴ Report by Chia Ch'i-yung, in *T'ung-chi Kung-tso T'ung-hsün* (Statistical Bulletin), No. 3, Peking, 1955, p. 3.

the 1955 national economic plan. During the years since 1958, the complete collapse of the statistical reporting system as an aftermath of the Great Leap has again brought the question of coverage to the fore.

The shortcomings of incomplete coverage have been compounded by the inaccuracy of such statistics as can be collected. An example of inaccurate statistical reporting at the midpoint of the First Five-Year Plan may be found in a 1955 report by a deputy director of the State Statistical Bureau discussing the problem in 1954. In a survey of statistics from Liaoning Province where the organization of statistical work had begun at an earlier date than in the country as a whole, there were 14,321 cases of erroneous reporting from the 232 national and local government industrial enterprises whose statistics were examined. Of these, 708 presented major problems, while cases of deliberate falsification numbered 476 or 3 percent of the total reports. The situation in other areas was probably worse.

Inaccuracy has characterized even statistics where coverage should not be a major problem. It stems from several different causes. The use of inadequately trained and inexperienced reporters, particularly because of the very large number of statistical reports required at all levels of administration, reflects the dilution of staff and the inevitable deterioration of quality. This effort has been felt not only in the collection of raw statistical data but also in their processing at later stages. A notable instance of gross inaccuracy was the erroneous estimate of food grain production in 1958 which first gave the total at 375 million metric tons, equivalent to a 100-percent increase over the reported output of 1957. In 1959, the figure was revised to 250 million tons, which was still a sizable overestimate according to some students of the problem.¹⁵ The error in 1958 was only a particularly notorious example of the possibly consistent inaccuracy exhibited by food grain production estimates during the first years of the First Five-Year Plan. Other examples of exaggerated reporting to which inexperience and lack of training on the part of the reporting agents contributed could be found in statistics of industrial production during the Great Leap, for instance, in the production of coal and steel.¹⁶

Changes in definitions and concepts used in the statistical reports which are inevitable in a developing reporting system may have been responsible for some of the inaccurate reports. Such a development was probably involved in 1956 with respect to the definition of "unit area yield" and the method of estimating total output based on yield. The use of imprecise categories in report forms which lend themselves to diverse interpretations has of course the effect of compounding the confusion.

The preceding discussion has indicated how errors may be made involuntarily as a result of the incompetence of the reporting agents and the circumstances that add to their confusion. In addition, there is the possibility of collusion between the agents collecting statistics and their sources of data. Refugees from Mainland China have men-

¹⁵ See John Lossing Buck, Owen L. Dawson, and Yuan-H Wu, *Food and Agriculture in Communist China*, the Hoover Institution, 1966.

¹⁶ See the discussion on coal and steel statistics in the author's *Economic Development and the Use of Energy Resources in Communist China*, 1963, and *The Steel Industry in Communist China*, 1965.

tioned the practice of suppressing reports of deaths in order for the families of the deceased to receive larger food rations. Such practices would affect the size of the registered population especially in years of food shortage, such as 1960-62. On the other hand, some Western demographers have argued that the 1963 Chinese census contained underreporting.

Another source of inaccuracy and confusion, especially during the period before the development of relatively complete statistical systems by the State Bureau of Statistics, consists of the existence of reports on generally the same economic activities but using different concepts and dissimilar categories. Such duplication and conflict occur when more than one Government agency is involved in reporting on the same set of facts, a practice which tends to be aggravated by the continual shifts of jurisdiction over different industries, the multiplication of the industrial ministries, and frequent mergers of agencies which have characterized the evolving administrative structure of the Communist government.

To the above we must add inherent bias as a source of inaccuracy. Beginning in the latter part of the First Five-Year Plan, overvaluation of new products at prices reflecting pilot costs has probably been a source of overestimate of production in the industrial sector.

Biased reporting is virtually inevitable when politics "takes command" as it did during the Great Leap. Under this slogan, statistical reports were to serve the express purpose of fanning enthusiasm and exhorting the population to greater productive effort. In practice, this meant that samples with an upward bias were often reported without qualification, which partly accounted for the very high productivity data recorded. The inaccuracy of statistics during 1958-60 attributable to this factor may be regarded, however, as an extreme case of a general predilection toward overoptimistic reports because of the assignment of production targets and work quotas to individual enterprises and work units and their employment in measuring performance. The pressure to report good results is equaled only by that of accepting them as accurate.

An entirely different category of inadequate information for planning purposes lies in the timelag between the availability of new data and their effective communication to the planners. In the first place, the collection and transmission of data may be delayed by the lack of automatic data processing equipment and the successive administrative levels at which relevant data must first be assembled. Even when prime data are transmitted both directly to the Bureau of Statistics and simultaneously to the successive higher levels of Government under a "double tracking system," errors and discrepancies cannot be entirely avoided.

Although theoretically the national economic plan and the State budget both begin operating from the first of the year, the date of their final adoption has varied a great deal in the past.¹⁷ In 1953 and 1958, the two documents were finally approved in February; in 1956 and 1960, the date shifted to March-April; in 1954 and 1957, it was not until midyear before these basic plans were adopted. The delays

¹⁷ Diao, *op. cit.*, p. 42.

in the formulation of the final national economic plan in the years mentioned may have been partly due to uncertainty about the data base. Clearly, operation during the months before the adoption of the plan could not be based on comprehensive planning and sectoral balance using final returns and targets.

According to a recent review of the subject,¹⁸ while computers have been employed in solving specific technological and economic problems—within the latter category, particularly in linear programming problems of transportation and location—statistics and other aspects of information, organization, and retrieval have apparently not received much attention in the development of computer use. Partly, the short time available between the date when data required for economic planning can become available and the date when the plan embodying the same information must begin to be implemented may be a result of the production process rather than inefficiency in data processing. In particular, information on the main fall harvest may be unavailable to the planners before plans for sowing and other preparations for the next planting must be firmly drawn up. In double rice crop areas, the second crop is harvested in October–November, while the early rice crop has to be planted in February–March of the following year. Thus, plans for the early rice planting may have to be made without full information on the size of the preceding rice crop. Where the production process is a continuous one, the problem is, of course, inherent. But because of the important role of agricultural production both in export and in the manufacture of consumer products and the scale problem in agricultural reporting this shortcoming is perhaps more serious than it is in other economic sectors. Given this situation, the planners must resort to estimates rather than verified results of the preceding period. We are therefore again confronted with the questions of reliability of estimates and of possibly inherent biases.

A SUMMARY

To recapitulate, during the period of the First Five-Year Plan, Chinese planners were probably without comprehensive nonagricultural data; such agricultural and nonagricultural data that were available were probably inaccurate, with an upward bias in the rate of growth of grain production, a possible underestimate of inventory for the earlier years, and an upward bias in industrial production and its rate of growth. For the first 3 years of the Second Five-Year Plan, statistical data available to the planners suffered especially from inaccurate reporting; political bias, deterioration in the statistical reporting system, and dilution of trained reporting staff as a result of an explosion of the volume of work led to gross exaggerations. For the entire period of 8 years (1953–60) the reporting system suffered from lack of means for the rapid and accurate processing and organization of statistical and other information. Thus all the data that might have been available could not be used by the planners in good time. One must therefore conclude that during the years when planning was

¹⁸ Donald G. Audette, "Computer Technology in Communist China, 1956–65," *Communications of the ACM*, vol. 9, No. 9, September 1966, pp. 655–661.

ostensibly carried out on a relatively systematic basis, the Chinese planners were actually without any firm data base for realistic planning. The data available to them had a distinct tendency to induce unwarranted optimism and to exaggerate the degree of success.

III. THE INDICATED BEHAVIOR OF CHINESE PLANNERS

PATTERN OF RESPONSE TO PLAN OVERFULFILLMENT OR UNDERFULFILLMENT

The preceding discussion has dwelt upon some of the reasons why plans are often unrealistic and why actual development may be erroneously reported and/or interpreted. We turn now to the question of how Chinese planners react to their own perception of success or failure in the implementation of plans apart from the correctness of the perception *per se*. Inasmuch as the observable behavior of Chinese planners has been limited to a relatively small number of years and information available is limited, the following discussion must be viewed as highly tentative. However, it is possible to detect certain indications of behavior which reflect the ideological and political background and outlook of Communist Chinese planners and which may, therefore, be regarded as more than random occurrences.

First, if performance appears lagging as a given plan is being carried out, a speedup is likely in the latter part of the same plan period. This means that speedups are probable in the second half of the year during an annual plan and in the last years of a 5-year plan. Both observations appeared to be true during 1953-57.

Second, the above-mentioned pattern is reinforced by impatience on the part of the Communist Chinese leaders and their constant desire to overfulfill plans.

Third, during a given plan period, if the plan is believed to be overfulfilled, the planned rate of growth for the next period is likely to be set at a higher level than that of the present period. A higher planned rate is likely to accompany a greater degree of overfulfillment, and vice versa. During the First Five-Year Plan, the relationship between the planned and the realized rates of growth in modern industry followed this pattern with the exception of 1955-56. The realized rate of growth in 1955 was only 1 percent above the planned rate while the planned rate of growth in 1956 was 21 percent higher than that of 1955.¹⁹

It is possible for the first type of behavior to dominate the third type when the two are in conflict as it did in 1956. On the other hand, it is conceivable for the third type of behavior to be dominant, in which case poor performance would lead to a lower planned rate in the fol-

¹⁹ The above statements are based on the following statistics of modern industry output:

	1952	1953	1954	1955	1956	1957
Percent increase of the planned output of the year over the planned output of the preceding year.....	-----	+38	+19	+13	+21	+12
Excess of the realized output of the year (in percent) over the planned output of the same year.....	+12	+7	+6	+1	+9	+4

Based on information from *Jen-min Shou-t's'e* (People's Handbook), Peking, 1955, pp. 419 and 431, and 1956, p. 70; *A Comprehensive Political and Economic Survey of Communist China* (text in Japanese), Tokyo, 1960, p. 379.

lowing period, or even to a downward revision of the plan during the same period. In general, because of the inherent desire to speed up and to fulfill planned targets, one would expect dominance of the third type of behavior (when it points to a slowdown or retrenchment) over the first to be exceptional. Exceptions are afforded either when confidence has already been severely shaken or when the original optimistic perception is shown to be wrong. The latter seems to have been the case in 1959.

During the first half of 1959, for example, the fulfillment of production plans lagged behind in the industrial sector. Of 33 principal categories of industrial products, 19 saw the fulfillment of upward of 40 percent of the annual plan while, in the remaining 14, less than 40 percent fulfillment was reported. These figures contrasted significantly with the usual semiannual plan fulfillment of 47 to 48 percent in industrial value output during the first 6 months of an annual plan. As reported in August 1959 by Chou En-lai,²⁰ a downward revision of the annual targets for the year was ordered although the revised targets were still generally higher than the perceived realized levels of the preceding year. The lagging plan fulfillment during this period was a direct reflection of the unrealistic targets originally set for the year while the initial setting of such high targets was a response on the part of the planners to the unusually large upsurge of production and plan overfulfillment reported, though not actually realized, in 1958. Chou explained the discrepancy between the initial 1959 plan and reality in the following terms:

There were certain shortcomings and errors made in the course of drawing up and implementing the 1959 national economic plan and during the upsurge of the Great Leap Forward; the main ones were that production targets were set rather too high, the projected scale of capital construction was bigger than it should be and the increase in the numbers of workers and staff a bit excessive. Our departments in charge of planning and economic affairs are not yet adept at the work of coordination and maintaining a balance under the conditions of a big leap forward in the national economic plan.²¹

If comparison is made between the planned rates of growth in the First and Second Five-Year Plans, the sharp rise of expectations in 1958 was again illustrative of the third type of behavior.

Fourth, when an underfulfillment of plans is perceived, the planners are likely to be reluctant to take immediate cognizance of the fact for political as well as ideological reasons. Politically, the Communist leadership, like all totalitarian regimes, still clings to infallibility. Ideologically, it is difficult for such leaders to be persuaded that their dialectics could contain basic errors. Downward revisions of plans are not precluded as a result, but they are likely to be delayed. The net result, therefore, is likely to be overcompensation when adjustments are finally made while earlier adjustments might have brought about more moderate changes. This case was well il-

²⁰ Chou En-lai's *Report on Adjusting the Major Targets of the 1959 National Economic Plan and Further Developing the Campaign for Increasing Production and Practicing Economy*, to the Standing Committee of the Second National People's Congress, Aug. 28, 1959, Peking, Foreign Languages Press, 1959, pp. 17-22;

²¹ *Ibid.*

illustrated by the directive in late 1961²² ordering the curtailment of investment and other activities.

ADJUSTMENT TO BOTTLENECKS

If we ignore all cases of deliberate disregard of the plan and of incompetent planning, we are left with discrepancies between actual performance and planned development of the economy which should be explained by (1) the effort to live up to the plan or to overfulfill it and (2) exogenous shocks suffered by the economic system. Mention has been made earlier of the common practice to speed up production and other activities in the second half of the plan period in order to fulfill or overfulfill the plan because of lagging performance during the first half, as well as the tendency to speed up the planned rate of progress when plan fulfillment or overfulfillment is perceived, rightly or wrongly. Both developments of this nature and exogenous shocks administered to the system, such as a major flood or drought or the sudden withdrawal of Soviet specialists and blueprints from China in mid-1960, would create bottlenecks in various sectors of the economy. The question then boils down to the effect of those measures which the planners are likely to take in order to resolve the immediate bottlenecks. Is it possible for overfulfillment of the plan in one sector to lead to underfulfillment in another? Could the net effect be a reduction of total output or at least a slowing down of the rate of growth?

The first and almost instinctive reaction to any shortage which may threaten plan fulfillment or overfulfillment, whatever may be its cause, is to call for economy and a reduction of the inputs required per unit of output. The admonition to increase unit productivity and lower cost can, however, lead to undesirable effects on the production of goods hitherto unaffected because of the noninclusiveness of the cost concept employed and the tendency to use more of those inputs which are not included in the cost. This is notably the case in regard to the employment of fixed capital. Since the degree of plan fulfillment is measured by certain indicators, such as the physical output quota, the management of an enterprise, when hard pressed, is liable to concentrate on one index of success at the expense of another. Underlying such behavior are both the very human tendency to pursue symbols of success rather than its substance, a tendency which is particularly fostered in any large organization or bureaucracy, and the Communist ideology which discourages the use of any meaningful criterion for the economic allocation of investment. The latter doctrinaire attitude is reflected in the expression, often employed in Communist Chinese circles, to the effect that "even if the meat in a stew should disintegrate (through overcooking) it would stay in the pot," by which is meant that no loss would be incurred in production, whatever may be its apparent cost, because in the absence of the exploiting class, all the fruit of labor now belongs to the people. What the people do not at first receive in one form, they will receive eventually in another.

Some economists in Communist China are well aware of the fallacy of this Chinese version of the "goulash principle," as may be seen in a

²² See Yuan-li Wu, *op. cit.*, 1965, pp. 102-103.

very outspoken article by Sun Yeh-fang, former Director of the Economic Research Institute of the Academy of Sciences, who questioned the paradoxical attitude of not paying heed to the effectiveness of using capital, the embodiment of their own blood and sweat, by the working people,²³ although the unenlightened capitalists used to care for such matters a great deal. But many leaders and cadres of the Yen-an tradition do not seem to be able to appreciate such ideas of economic revisionism.

In order to expand production or to alleviate a severe shortage, a frequently employed technique is to make the objective the central theme of a mass movement, which will generate its own momentum, and, in so doing, often create new shortages in other sectors of the economy. The mass approach which was exemplified in Communist China's notorious drive for steel and grain during the Great Leap, as well as in many other production campaigns, is derived from two traditions: that of making crash efforts in military combat during the period of the revolutionary war before 1949 and that of relying on the power and "wisdom" of the masses which Mao Tse-tung has learned to manage so well in political struggles of the past.

Still other measures of adjustment in the face of specific bottlenecks have been (1) withdrawal from inventory, which was said to have been resorted to widely early in 1956, and (2) reallocation of the scarce resources at the expense of categories of demand that enjoy lower priorities, a practice which has been frequently employed.

Withdrawal from stock held in reserve when the original stock is not large has the effect of increasing the vulnerability of future production to new bottlenecks. This effect was well recognized in discussion in China.²⁴ During 1955-56 and again during 1959, power, transport, and material shortages were met by allotting less to industries of lesser importance. Among the latter were included the light industries and direct demand for consumption.²⁵ In short, the consumer goods industries and even light industries which do not necessarily serve the consumers may be given short shrift. Not only could such adjustments lead to a direct decline of production in sectors previously not affected by the events which have necessitated the adjustments, but the lower priority given to the consumer may have far-reaching deleterious effects on labor productivity. Should there be a general decline of labor productivity, or even a decline in some sector(s) supplies from which are used by the majority of other sectors, a decline in total output—not just one in the growth rate—could very well occur. Such was probably the case when serious bottlenecks arose in 1959-60 about the time of the upper turning point which marked the end of the Great Leap and the beginning of the Great Depression of the Communist period.

Still another course of adjustment is the employment of substitutes for products or inputs that are in short supply. The extent to which

²³ See Sun Yeh-fang, "Lun Chia-chih" (On Value), *Ching-chi Yen-chiu* (Economic Research), No. 9, Peking, September 1959, p. 64.

²⁴ See Men Tso-ming, "Hsi-ch'ü I-chiu-wu-liu-nien Wu-ts'u Kung-ying Kung-tso-chung ti Chia-hsun" (Lessons from Work in Material Supply during 1956), *Chi-hua Ching-chi* (Planned Economy), No. 2, Peking, 1957, pp. 8-9.

²⁵ See, for instance, Liu Lan-p'o in *Jen-min Shou-ts'e* (People's Handbook), 1957, pp. 441-442, and Kuo Tzu-ch'eng et al. in *Ching-chi Yen-chiu* (Economic Research), No. 6, Peking, June 1959, pp. 18-31.

this measure can be effectively adopted depends upon the availability of unemployed resources at the time and the degree of substitutability between inputs, whether unemployed or employed, and their intersectoral transferability. Until 1956, considerable leeway in unemployed labor probably existed although the reserve capacity of other unemployed factors, especially industrial equipment, was very limited. By the time the First Five-Year Plan ended, Chinese production was approaching the boundary set by available resources, and further growth would have to rely upon new investments, expansion of the labor force, and improvements in technology. In fact, this was probably one of the principal reasons for the introduction of the small industry movement and the reorganization of labor in the communes as a part of the Great Leap program.

The unlimited substitutability of certain inputs for others that are in short supply cannot be readily assumed especially where specialized equipment and industrial raw materials used in certain production processes are concerned. The very limited substitutability of unskilled labor, made available in the communes, for capital equipment was aptly demonstrated by the failure of the backyard furnace movement which has been given recognition by the discontinuation of the drive and emphasis on quality and technological innovation during the 1960's. It is quite possible, therefore, that the level of productive investment in Communist China may not be determined by the availability of savings or the extent to which private consumption can be curtailed. Rather, it may be subject to a ceiling imposed by the availability of imported equipment which, in the absence of Western credit, now that large Soviet credit is unlikely, is a function of the capacity to export. The latter constraint may be much more stringent than the former, and as long as this condition is unchanged, adjustments to sectoral shortages by substitution would be strictly limited. The economists may find here a classical case in which inflexibility in factor supply becomes a serious obstacle to steady growth.

IV. PLANNING AND THE CHINESE DEVELOPMENTAL MODEL

From the preceding discussion it appears that comprehensive economic planning of the type described in theory at the beginning of this paper did not exist during the first 3 to 4 years of the First Five-Year Plan. The requisite data for planning were not fully available, nor was the apparatus of planning and plan implementation fully operative. However, real growth was registered during this period although the perceived rate of growth was exaggerated. Sectoral shortages also developed during this period, but they were met without too great difficulty because of the existence of unemployed labor and accumulated stocks. This state of under full employment came to an end by the time the First Five-Year Plan had about run its full course. The period of growth coincided with one in which there was no comprehensive economic planning.

However, partly because of the exaggerated growth under the First Five-Year Plan as perceived by the planners, an increase in the planned rate of growth was ordered at a time when the boundary of production possibility had just been reached. These circumstances resulted in serious discrepancies between the planned growth of the

economy and its actual performance, and in the face of drastic adjustments, the Chinese planning model for balanced and rapid growth proved to be unequal to the test. Thus, we are brought to the perhaps unexpected conclusion that Communist China does not really have any past experience in successful development under a *comprehensive* national economic plan which she can bring to bear upon the formulation and implementation of the Third Five-Year Plan that officially began in 1966. The previous two five-year plans do not offer her a reliable model that she can safely repeat. This is not to say that there has not been any planning experience or that errors of the past could not be avoided if the behavior of the planners and, even more important, of the political leaders, were modified. Nor does it mean that Communist China cannot attain certain high priority goals, such as the development of nuclear weapons.

On the basis of the behavioral pattern we have drawn, together with some of the technical relationships which appear to prevail at this stage of Chinese economic development, it is possible to describe the Chinese economic model in terms of a few propositions:

Proposition 1.—Communist China's leadership is anxious to see the Chinese economy develop and, in particular, industrialize as rapidly as possible. For this reason they have been, and continue to be, prepared to depress consumption in order to maximize the rate of investment. During the period of economic expansion up to 1960, there was a tendency to accelerate the investment rate. In the future, one should expect the rate of investment to remain at a high level so that the minimum level of consumption deemed necessary by the leaders will constitute a theoretical upper bound to the planned rate of investment.

Proposition 2.—Past experience shows, however, that apart from certain types of labor-intensive investments, such as water conservation work, building of unpaved roads, etc., productive investment may be effectively limited by the supply of machines and, in particular, by the availability of imported materials and equipment for which there is no domestic substitute. Thus, for some time to come, at least a portion of the total investment that can contribute effectively to economic growth may be subjected to a far more stringent constraint than the availability of savings.

Proposition 3.—The limits imposed on certain investments by the available supply of factors is but a reflection of the general lack of flexibility in factor supply and the limited maneuverability of the Chinese economy to meet sectoral shortages through substitution. Past experience again shows that labor is not universally useful as a substitute for capital and that even when it can act as a substitute, serious differences in product quality may develop. Consequently, it is essential for the Chinese economy to maintain a reasonable input-output balance between sectors if steady growth is desired.

Proposition 4.—The past behavior of Chinese planners and managers suggests that sectoral imbalance is likely to emerge as a result of exhortations to overfulfill plans and the limited outlook of the managers in their eagerness to fulfill and exceed certain output targets. This threat to balanced growth is enhanced if the planners deem the record of their planning in the immediate past to be successful because of the impatience inherent in their behavior. The same threat

may also be heightened by exogenous shocks administered to the system. In the past, such shocks have originated essentially, if not solely, from the political policies and ideological attitudes of the Communist leadership. The political origin of the Sino-Soviet dispute is a case in point.

Proposition 5.—While Chinese planners are conscious of the need to maintain a minimum living standard and to see per capita consumption improve, whenever sectoral shortages occur, resources are likely to be diverted from the production of consumer goods. The puritanical and austere modes of life which the Communist leaders have advocated as appropriate to the continuing revolution have contributed to a general reluctance to employ material incentives in lieu of ideological exhortations.

Proposition 6.—Because of the relatively low level of per capita consumption in existence, labor productivity is likely to be adversely affected if the supply of consumer goods is sharply curtailed as a result of adjustments to meet sectoral shortages. This occurred toward the end of the Great Leap and, though probably to a much lesser degree, in 1956.

Proposition 7.—In the past, Communist China's leaders have frequently employed mass organizations and political campaigns involving very large numbers of persons in attempts to complete certain tasks. This method, in which the leaders have placed great faith as a result of their personal political experience and Communist ideology, has often led to secondary economic disruptions when it is employed to relieve sectoral shortages, such as the use of harvest workers for flood control or steel and fertilizer production.

Proposition 8.—Because of inaccurate statistical reporting, delays in communication, and reluctance to admit failure, an effective downward adjustment of the planned rate of growth to restore imbalance may be delayed. Consequently, as was the case in 1961-62, the downward adjustment may result in overcompensation, converting a retrenchment to a decline.

Proposition 9.—Since 1958, and especially since the withdrawal of Soviet specialists in 1960, the inflexibility of the economy with respect to specific factor supplies has become a major concern of Communist China's leaders. Its solution constitutes a primary objective of China's present day applied research in science and engineering under the direction of the Scientific and Technological Commission. The successful nuclear detonations have demonstrated Communist China's independent technical capability in a rather limited sphere. Increased flexibility in factor supply and intersectoral substitutability could result from an uninterrupted major scientific effort on a broader scale.

The above model of the Chinese economy is one in which renewed expansion under the Third Five-Year Plan could well lead to an initial period of expansion followed by a downturn. However, even if the cyclical pattern repeats itself, it is entirely possible that the fluctuations would be "damped" if statistical reporting is improved, the response time shortened, and, above all, the behavior of the planners restrained. The last point leads to the following questions:

First, will the Chinese planners be less impatient? Perhaps a more appropriate question would be whether the Communist political leaders can afford to be more patient. Second, is it doctrinally possible for Communist China's leaders to permit material incentives to play a greater role and to continue to give consumption a higher place in their scale of priorities beyond the recovery period of 1962-65? Third, will Communist China maintain an educational and scientific policy that would provide the necessary professional manpower to put the country on a technologically independent basis and to give the economy more flexibility through technical innovation? Lastly, will the Communist leaders pursue domestic and foreign policies that would avoid giving serious shocks to the smooth operation of the economic system?

At this writing, Communist China is in a political flux. The Red Guards movement and internal purges which are carried on under the euphemistic banner of "cultural revolution" and the questionable hold of Mao Tse-tung and his potential successors on the country would seem to indicate certain trends, which, if continued, are more likely to repeat the unhappy experience of the past than to chart out a course of steadier growth under a realistic national economic plan. Some would say that the answers to all four questions raised in the preceding paragraph have already been given in the negative. Thus far, however, the outward political phenomenon of great instability could well turn out to be a political struggle from which a new leadership would emerge. It would be too early to postulate the behavior of the new leaders, not only in their capacity as the immediate replacements of Mao, but in the more distant post-Mao period, until their identities and policies can be established beyond a doubt.

However, should the Chinese planners learn their lessons well and balanced growth follow, the national economic plan as we have described would still not guarantee that the scale of priorities adopted will reflect in any sense the true preferences of the population. For this to happen the plan would have to be predicated upon an effective and meaningful pricing system as the Soviet Union has virtually admitted. Such a development is ruled out for the time being in Communist China inasmuch as it is considered utterly "revisionist."

TRENDS IN CAPITAL FORMATION IN COMMUNIST
CHINA

BY
WILLIAM W. HOLLISTER

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TRENDS IN CAPITAL FORMATION IN COMMUNIST CHINA

INTRODUCTION

This paper is concerned with the process of capital formation and its relation to the trends that have occurred in Mainland China since 1950. Capital formation refers to the increases that have taken place in the productive facilities of the Chinese economy in inventories, installations, and equipment for production of goods and services. This study will concentrate on *gross fixed investment* excluding that portion of gross investment that involves increases in inventories. The broadest definition of fixed investment would include all net acquisitions of goods or facilities for production or use in future time periods. On this basis the acquisition of consumer durables by households and the procurement of military equipment would be included under investment. Neither of these categories is included in investment as defined in this study. In Communist China household purchases of consumer durables other than housing are small; furniture and bicycles are typical items excluded. Expenditures for military equipment represent nonconsumption expenditures that must be financed in the same way as state investment, and such equipment represents capital available to the military establishment that is cumulative over time. Unfortunately, there is no data sufficiently reliable to justify the inclusion of such expenditures in fixed investment.

Measurement of capital formation is difficult because of the usual problems in the use of official Communist data. The limitations in such data with the inevitable distortions and deficiencies are compounded in the case of China by the kaleidoscopic shifts in economic policies that have taken place in the comparatively short period of time since 1950. Officially the period 1950-52 was a period of recovery when production was rising to levels already attained in the 1930's for China proper and in the early 1940's for Manchuria. Actually this process of recovery continued in the years 1953-55. The period 1950-55, therefore, represents a period of substantial recovery in all sectors from the disruptions of the Sino-Japanese war and the civil war that followed. The period of the First Five-Year Plan—1953-57—represents a planning framework for rapid industrialization made familiar by the Soviet program for economic development. This Chinese program was only taking hold in the years 1953-55 and did not become a dominant feature until the years 1956-57. The Leap Forward program for the years 1958-60 represents a drastically new policy framework introducing many changes in economic organization and production. This Leap Forward framework was superimposed on the First Five-Year Plan program for rapid industrialization that was gaining momentum in heavy industry in the years 1958-59. Since 1960 with the drastic setbacks in the Chinese economy following

the Leap Forward there has been a prolonged period of retrenchment, officially termed the "period of consolidation and readjustment." This readjustment period is now considered to have ended in 1965, and 1966 is termed the first year of a Third Five-Year Plan scheduled for 1966-70. With most of 1966 behind us, however, it is clear that this Third Five-Year Plan bears little resemblance to the planning pattern established for the Soviet economy. Annual production targets that are to be fulfilled or overfulfilled seem to be scorned by the Chinese Communist leaders as a "revisionist" approach to economic development. Political campaigns and *ad hoc* planning have taken the place of planning on the Soviet model.

The data permits estimates for fixed investment with any degree of reliability only for the years 1950-59. Even in this period the data for 1950-53 and for 1958-59 are less reliable than the far from satisfactory data for 1954-57. For the 7-year period 1960-66, only the skimpiest of data is available and there are no aggregate figures permitting direct estimates of fixed investment in these years. This paper will concentrate on the main conclusions to be drawn from the author's estimates of fixed investment, and not on the methods and procedures used in securing these estimates.* Important differences between our conclusions and those of other scholars will be noted for the reader's benefit. In general, differences in the underlying estimates of capital formation are overshadowed by differences in interpretation and judgment as to the important trends in the Chinese economy.

THE RATE OF INVESTMENT AND GROWTH

Analysis of the growth potential of an underdeveloped economy like China's has usually proceeded in terms of two key aggregates. First, a definite ratio exists between savings and national income and this rate is considered to be a function of per capita incomes. China, with a very low level of per capita income, is expected to have a low rate of savings. Second, the rate of saving determines the proportion of output going to increments in the capital stock and a specific relation exists between increments to capital and increments to national income. The rate of saving and the incremental capital-output ratio (ICOR) together determine the rate of growth in national income. The problem of economic development in this approach is to raise the rate of saving and thereby permit an important increase in the rate of growth of total output.

Using this framework of analysis and given the low level of per capita incomes in China, it is clear that the Chinese Communist system has been successful in raising the rate of investment to levels that should permit important and sustained increases in per capita income. Table 1 presents the key estimates for the rate of investment in current market prices for the years 1950-59.

Table 1 gives estimates for depreciation for those readers interested in calculating net investment rates. Depreciation allowances represent

*A brief summary of the basis for the estimates used in this paper is presented in the appendix, p. 151. The author is grateful to the Committee on the Economy of China of the Social Science Research Council for a grant supporting research on this topic.

TABLE 1.—Gross investment in Communist China

[Current market prices]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Billion yuan										
Gross domestic investment ¹	6.09	11.47	14.57	18.45	19.40	19.14	19.69	25.31	44.27	49.14
Net balance of foreign claims ².....	.15	-.96	-.92	-1.01	-.31	-1.08	.32	.51	-.07	-.50
Gross fixed investment ¹	3.24	5.77	8.42	12.59	14.12	13.92	19.87	18.77	33.47	38.73
Gross national product ²	46.98	63.94	70.12	85.28	90.47	92.55	104.66	112.21	136.1	147.8
Depreciation ²	2.62	2.98	3.31	3.76	4.15	4.50	4.97	6.29	7.03	8.08
Percentages										
Gross investment.....	13.0	17.9	20.8	21.6	21.4	20.7	18.8	22.6	32.3	33.2
Change in inventories.....	(6.1)	(8.9)	(8.8)	(6.9)	(5.8)	(5.6)	(-0.2)	(5.8)	(7.9)	(7.0)
Gross fixed investment.....	(6.9)	(9.0)	(12.0)	(14.8)	(15.3)	(15.0)	(19.0)	(16.7)	(24.6)	(26.2)

¹ Figure taken from appendix table A-1.² For methodology, see appendix.

provisions for financing replacements of the capital stock and vary widely as between various economies and various types of economic institutions. Depreciation is not a measure of the amount of capital that has been scrapped or has worn out. This analysis follows the United Nations study of European economies¹—in concentrating on gross fixed investment as the key aggregate for analysis. Rates of saving involve not only fixed investment but changes in inventories, and so figures for gross domestic investment are also given in table 1. The data on inventories are far less reliable than for fixed investment. The importance of foreign investment in the form of grants or loans is also of interest, and rough magnitudes are given for net foreign investment showing that in the case of China most savings have been achieved internally.

The figures in table 1 show that by 1952 the rate of gross investment was raised to one-fifth of total output and maintained at that level through the period of the First Five-Year Plan (1953-57). The Leap Forward push raised the rate of investment dramatically to about one-third of output in 1958-59. These rates include substantial percentages of output for increases in inventories in all years except 1956, but gross fixed investment is estimated at 12 percent of GNP in 1952 and increased to about 15-17 percent in the years 1953-57. The Leap Forward rates for gross fixed investment are one-quarter of total output and more than double the 1952 rate. These rates of capital formation are very much higher than the rate in 1933. According to estimates made by Liu and Yeh,² gross fixed investment in 1933 in current prices was about 5 percent of gross domestic product.

The rates for fixed investment shown in table 1 can be compared to the estimates made for Japan—a country that is almost a perfect model

¹ United Nations, *Economic Survey of Europe in 1961*, pt. 2, "Some Factors in Economic Growth in Europe During the 1950's" (Geneva, 1964).

² T. C. Liu and K. C. Yeh, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-59*. (Princeton, N.J.: Princeton University Press, 1965.)

for a successful long-term rate of economic development. Rosovsky's figures for Japan are as follows:³

TABLE 2.—Fixed investment excluding military investment as percent of GNP for Japan

	[Overlapping decade averages]		[Overlapping decade averages]
1887-96	9.1	1912-21	12.8
1892-1901	8.4	1917-26	14.4
1897-1906	8.4	1922-31	14.7
1902-11	10.1	1927-36	14.3
1907-16	10.6	1931-40	15.8

A comparison of these estimates with the China figures for 1953-57 and allowing for small amounts of military construction in the China estimates indicates about the same rate of investment as in Japan in the 1931-40 decade and only a slightly higher rate than in the period after World War I. The China figures for 1958-59 were achieved in Japan only in the 1950's.

For the period since World War I, Rosovsky's figures for gross fixed investment excluding military investment average 14.8 percent and the average annual rate of growth is about 4.8 percent—giving an implied long-term incremental capital-output ratio (ICOR) of about 3.0. For the earlier period, 1887 to 1912, the implied ICOR is lower than this—closer to 2.0 than to 3.0. The ICOR for China has shown no stability over the period 1950-59. Allowing a year lag, for the whole period 1950-59, the ICOR was 1.65. For the recovery period 1950-53 the ICOR was quite low—0.8; for the 1953-57 period the ICOR was 2.0; and for the Leap Forward years about 1.3.

Figures for Asian countries in the 1950-59 period for gross fixed investment, growth rates, and ICOR's are shown in table 3:

TABLE 3.—Gross fixed investment as a percent of GNP (in constant market prices), rates of growth, and incremental capital-output ratios¹

Country	Average rate of gross fixed capital forma- tion (percent)	Average rate of growth in product (percent)	ICOR
Japan, 1950 to 1959	21.6	9.1	2.4
Burma, 1951 to 1959	17.1	5.1	3.4
India, 1950 to 1959	14.9	3.1	4.8
Thailand, 1952 to 1959	14.4	5.5	2.6
Taiwan, 1950 to 1959	13.1	7.9	1.7
South Korea, 1953 to 1959	12.3	5.1	2.2
Ceylon, 1950 to 1959	11.3	3.9	2.9
Pakistan, 1950 to 1959	7.8	2.6	3.0
Philippines, 1950 to 1959	7.0	6.0	1.2
Indonesia, 1951 to 1959	6.2	3.6	1.7
China (estimates):			
1950 to 1957	15.9	8.9	1.8
1952 to 1957	(17.5)	(7.6)	(2.3)

¹ Figures for Asian economies given in the *Economic Survey for Asia and the Far East, 1961*.

In table 3, figures for China for 1958-59 are omitted because of problems in the data and because subsequent years clearly show that their inclusion would distort the comparisons. The 1950-53 years in

³ Henry Rosovsky, *Capital Formation in Japan*, (New York: The Free Press of Glencoe, 1961).

China are recovery years, but they are also recovery years for most other Asian countries. No clear conclusions emerge from the comparisons in table 3. The rate of gross fixed capital formation in China does not show that a Communist system is the only way to get high rates of fixed capital formation, because most of the Asian countries also achieved rates close to China's in the 1950-57 period. South Korea and Taiwan, however, financed a large portion of investment with foreign aid. The ICOR for China is in the expected range but why it is much lower than India's; pretty much the same as the ICOR for Japan, Ceylon, and Thailand; and higher than the ICOR for Taiwan and the Philippines is far from clear. The differences might lie in the estimates themselves, but the most likely hypothesis is that there is no simple and direct relationship between the three variables: the rate of investment, the rate of growth, and the incremental capital-output ratio.

In a paper of this scope it is not possible to go into all the considerations that are involved in the assumption that incremental capital-output ratios constitute a valid basis for analyzing trends in underdeveloped economies. It is our conviction that incremental capital-output ratios are only surface reflections of the underlying factors operating in the course of economic development. In themselves incremental capital-output ratios tells us nothing that we need to know about economic trends. In the rest of this paper we will attempt to analyze the alternatives faced by the Communist planners in formulating their investment policies and the implications of the kaleidoscopic shifts in investment policies that have occurred.

SECTOR ALLOCATIONS OF FIXED INVESTMENT

Our estimates of fixed investment use a methodology that permits allocations of investment to the various sectors. Table 4 presents percentage shares in each year for fixed investment in the major sectors of the economy. The share for agriculture has remained stable over the period 1954-59 in spite of large increases in the absolute amounts of fixed investment. Transport has also commanded a fairly stable share of total fixed investment. The main feature of trends in sector allocations has been a steady rise in investment allocations for industry, construction, and utilities. The share for heavy industry alone reflects the very high priority given to this sector by the Communist planners with rising percentages throughout the period. There has been some decline in the share for residential construction, but the rising share for industry, construction, and utilities has been mainly counterbalanced by a decline in the share for services and trade.

The percentage shares for some European market economies are given in table 5. The allocations for China for agriculture are roughly twice those for Western economies with the exception of Turkey, where agricultural investment is nearly as high a percentage as for China. The percentages for industry, construction, and public utilities in China are not much higher than for Western economies except for the years 1958-59 when one-half of total investment go to these sectors. Only Yugoslavia has as high an allocation for these

TABLE 4.—Sector shares of gross fixed investment ¹

[Current prices]

Sector	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Agriculture ²	31.5	25.5	24.9	20.7	22.4	24.5	22.8	23.0	24.0	23.2
Industry, construction, and public utilities.....	21.0	27.7	28.7	33.0	34.4	34.3	37.8	41.3	50.9	49.8
Heavy industry.....	(3)	(3)	(15.0)	(17.1)	(20.2)	(24.6)	(26.2)	(29.2)	(41.1)	(40.6)
Light industry.....	(3)	(4)	(10.0)	(10.2)	(8.2)	(4.0)	(4.6)	(5.7)	(5.9)	(5.9)
Transportation and communications.....	12.3	11.8	10.3	9.4	11.0	13.8	13.8	12.6	10.0	12.2
Residential construction ²	12.4	12.8	14.6	10.2	9.5	10.5	8.4	9.7	6.6	6.6
Service and trade.....	22.5	22.2	21.6	26.5	22.8	16.8	17.0	13.4	8.4	8.3
Total fixed investment ⁴	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹ Sector investment are based on estimates of investment for nonproductive purposes that are subtracted from the sector allocations for State investment. All private investment other than industrial investment, handicrafts, and native transportation have been included under investment in trade although small amounts of this investment may properly have fallen under other sectors.

² One-third of self-financed agricultural investment is estimated to be construction and half of this is assumed to be for housing.

³ Not available.

⁴ Subtotals do not necessarily add to the total because of rounding.

sectors as that shown for China in 1958-59. No data are available on the breakdown between heavy industry and light industry in the Communist classification, but it is not likely that the European market economies allocated so preponderant a share of industrial investment to heavy industry as the allocations shown for China. Transport and residential housing command much smaller shares in China than in these countries.

TABLE 5.—Sector shares of gross fixed investment; average 1949-58 with exceptions noted

Country	Agriculture	Mining, manufacturing, construction, public utilities	Transport	Dwellings	Services	Total
Southern European countries						
Greece.....	10.5	26.1	14.2	34.6	14.1	100.0
Italy.....	13.0	33.2	19.9	21.9	12.0	100.0
Turkey (1950-58).....	21.6	29.5	21.3	18.6	9.0	100.0
Yugoslavia.....	8.8	49.7	15.6	14.8	11.1	100.0
Spain.....	10.4	32.7	-----	15.9	-----	100.0
Portugal (1952-58).....	12.5	34.4	16.9	20.2	16.1	100.0
Selected developed economies:						
Western Germany.....	8.8	37.1	14.8	22.7	16.6	100.0
France.....	11.2	38.2	14.5	24.5	11.7	100.0
United States.....	6.6	31.9	14.3	28.6	-----	100.0
United Kingdom.....	4.4	41.0	13.4	21.2	20.0	100.0

¹ Excludes construction.

Source: United Nations Publication, *op. cit.*, ch. II, p. 51.

A. INVESTMENT IN AGRICULTURE

The most familiar charge against the investment policies followed by Communist planners during the period 1953-57 is that the priority for heavy industry starved agriculture of the investment funds that could have yielded larger increases in agricultural output. In the discussion that follows, it must be remembered that the actual esti-

mates for agricultural investment are higher than estimates made by others. The year-to-year changes in agriculture investment, however, are not greatly different in these alternative estimates.

The percentage shares for agriculture shown in table 4 do not show that this sector has received insufficient investment. Agriculture in China contributes perhaps twice as much to national income as the percentages shown—about 22 percent of fixed investment—but no country undergoing economic development can be expected to have investment allocated in proportion to existing sector shares of GNP. In the 5-year period (1953-57) fixed investment for agriculture approximately doubled in magnitude. In the 1958-59 Leap Forward effort, agricultural investment again doubled in absolute magnitude. The Soviet analogy has often been cited in this context, but even in the Soviet case the problem probably lies more with the ineffectiveness of the agricultural investment undertaken than with the magnitude of the agricultural investment effort itself. In the case of China the strategy for agriculture outlined in the First Five-Year Plan seems quite sensible in concentrating on labor-intensive investment such as irrigation rather than pushing mechanization of agriculture. With China's large population, any very large release of manpower from agriculture was not indicated. The major problem is in increasing yields per acre, and for this objective the major emphasis needs to be on greater supplies of chemical fertilizer and other key inputs.

The heavy industry bias in China stressed imports of machinery and equipment for heavy industry when imports would much more wisely have been in the form of chemical fertilizer and other supporting inputs for agriculture. In the 1953-55 period too low a priority was given to increasing chemical fertilizer production; and this is a defect that applies not to the allocations of investment to agriculture, but to the allocations of heavy industry investment within heavy industry itself. The chemicals industries were relatively weak in China, and the greater priority needed for chemical fertilizer would have meant a somewhat lower increase in heavy industry output. The problem of increasing agricultural production in China is a problem of modernization—of improving farm technology. Given the traditional system of production and the usual deficiencies in Communist methods of socializing agriculture, definite limits are set on potential increases in output as a result of agricultural investment. The problems being faced by the Communist planners at the present time would be very much simplified if additional allocations of investment to agriculture would be all that is needed to increase production.

B. RESIDENTIAL CONSTRUCTION

Table 4 shows the percentage of fixed investment for residential construction at less than 10 percent in the 1953-57 period. The percentages are far below those shown in table 5 for European market economies. Most European countries show a pattern of sector allocation for dwellings between 20 and 30 percent, with Turkey, Yugoslavia, and Spain in the 15-20 percent range. A comparison for Asian economies with the estimates made in this paper would not show such differences. The estimates for Taiwan⁵ show the average

⁵ *Economic Survey for Asia and the Far East*, 1961.

percentage of fixed investment for 1957-63 for dwellings as 12 percent. Rosovsky's figures⁶ for Japan show residential housing as percentages of total fixed investment excluding military construction as follows:

1887-96 -----	27.7	1912-21 -----	12.9
1892-1901 -----	23.4	1916-26 -----	11.4
1897-1906 -----	17.3	1922-31 -----	9.1
1902-11 -----	10.3	1927-36 -----	7.5
1907-16 -----	11.8	1931-40 -----	5.4

Since 1954 residential construction in Japan has run between 9 and 7 percent of total fixed investment.

The estimates for China have taken as the starting point investment by all socialist enterprises furnished in the official data. But it has been estimated that in the 1950-55 period substantial amounts of residential construction were undertaken in the private sector. As late as 1954, half of the urban labor force was in the private sector. The estimates for private investment in urban housing for the years 1950-55 is about 70 percent of the official figures for investment by socialist enterprises. There is no question that official policy by the planners was concerned with holding housing construction to a minimum, but even for State investment, the planners' efforts were not completely successful. State investment in urban housing for 1953-57 was much higher than the First Five-Year Plan targets, and so-called non-productive investment exceeded the quotas in the plan by much more than investment in productive fixed assets. Less important in the estimates for investment are estimates for major repairs equal to 1 percent of the value of the housing stock. Such major repairs are estimated to have been sufficient to keep the existing stock of urban housing habitable and inhabited in the 1950-59 period. The picture shown by the estimates is a rise in urban housing barely sufficient to maintain a low living standard in urban areas for housing in view of the rapid rise of the urban population.

Kang Chao's study of urban housing⁷ reaches a very different conclusion—that there has been a drastic deterioration in urban housing in the period 1949-60. By 1957 per capita housing is found to have declined by one-third from the 1949 level and by 1960 the urban housing situation is estimated to be one-half of the 1949 level. Actually such a trend would involve massive efforts in rationing housing space in urban areas and tensions that do not seem to have occurred in the period under consideration. The article was received too late for a detailed analysis of the sources cited. The data, however, would have to be quite reliable to substantiate the conclusions in our view, because the general assumptions are most implausible. Much urban residential construction uses dirt to be packed into walls and other materials not subject to the system of state controls for cement and other key commodities. Most of the labor involved can be furnished by the residents themselves in many cases and by handicrafts labor available locally outside the state apparatus.

Even if private investment in housing was not undertaken because of the prevailing situation, it is most unlikely that the major repairs

⁶ Rosovsky, *op. cit.*

⁷ Kang Chao, "Industrialization and Urban Housing in Communist China," *Journal of Asian Studies*, XXV, 3, May 1966, 381-396.

necessary to maintain the urban housing stock that existed in 1949 were not undertaken. Kang Chao estimates that 2 percent of the urban housing stock disappeared each year and by 1960 one-fifth of all housing that existed in 1949 had simply disappeared. For every square meter built under state investment, two-thirds of a square meter of housing had collapsed or was razed. The estimates in this study involve increments of living space per person of 3.24 square meters—well below the average urban living space as estimated by Kang Chao for all years through 1957. The main difference is that the housing standards in 1949 are estimated to be much lower than for Kang Chao's estimates. Many conclusions about trends in Communist China are not verifiable when all the research has been undertaken that is necessary. But the difference between these estimates of residential construction and Kang Chao's estimates does not fall in this category. Pending this research, the reader will have to make his own judgment.

C. INVESTMENT IN TRANSPORTATION

Table 4 shows the percentage allocations for transportation in a range between 10 and 14 percent. As with residential construction, transportation was clearly a grudging recipient of investment funds in the Communist planning framework. The percentage share for transport in most years is somewhat lower than the percentages shown in table 5 for the European market economies. Etienne⁸ considers the Communist policy with respect to investment in the transportation system as plainly inadequate. In terms of per capita meters of highways or railway track or any other yardstick that might be used, the transportation system in China is at a very low level in relation to the economy.

Over the long run the level of investment for transportation will probably rise above the levels for the 1950-59 period. The trends in 1950-57 are accounted for in part by the large Japanese investment in Manchuria and in north China prior to and during the Sino-Japanese war. In north China the rail system was built up for military reasons on a scale not justified in terms of the pre-Communist production levels. Judged by the population and by total GNP the transportation system may be considered inadequate. Judged by the capabilities of the transportation system to support the existing heavy industrial base, however, the situation was relatively favorable.

D. INVESTMENT IN LIGHT INDUSTRY

The allocations of investment for light industry represent an attempt to hold the allotments for such industries as textiles and food processing to a minimum, but at the same time furnish sufficient investment to process the flow of raw materials from agriculture. A source of much potential additional investment in light industry consists of equipment to process the existing supply of agricultural raw materials more efficiently and reduce costs of production. Such a program would have displaced handicrafts production more rapidly and reduced the labor requirements for light industry production. Light industry

⁸ Gilbert Etienne, *La voie chinoise* (Paris: Presses Universitaires de France, 1962).

investment undertaken, particularly for textiles, was concentrated in larger scale production facilities and tended to be labor displacing. Except for canneries and certain food industries, however, extensive labor-displacing investment in light industry does not seem to have occurred in the 1953-57 period. Considering the situation in China, this investment policy was reasonable. The central defect in the allocation of investment for light industry was the failure of the Communist planners to increase the potential for production of raw materials that could substitute for raw materials dependent on agriculture and on the land. Communist North Korea in this period, for example, was attempting to develop synthetic fibers for its textile industry, but the textile industry in China remained overwhelmingly concentrated in cotton textiles. Such a change in investment policy for light industry, however, would depend on heavy industry to produce the necessary raw materials, and involves the allocations of investment within heavy industry even more than the direct investment in light industry itself. As with chemical fertilizer production, production of synthetic fibers would require development of the chemicals industry. In the 1960's, there has been a shift in investment policies in this direction. This effort should have started a decade sooner.

E. INVESTMENT IN TRADE AND NONAGRICULTURAL SERVICES

Allocations for trade and nonagricultural services declined in the years 1955-57 compared with earlier years. This investment includes military construction in substantial amounts up through 1954. Trends in income originating in government reflect a large military and administrative apparatus already established by 1952 and only small increases in the 1953-57 period. The percentage share for these sectors even in 1955-57 is about the same as those for the European economies shown in table 5. The Communist bias against nonproductive investment is compensated for to a large extent by the political and ideological advantages of a state-sponsored program for education and communal services.

CAPITAL FORMATION AND RAPID INDUSTRIALIZATION

The key trend in capital formation in the 1950-60 period was the priority program for heavy industry. Table 4 shows that the percentage allocation fixed investment for heavy industry in 1957 was twice as high as the 15-percent allocation in 1952. The percentage for investment in heavy industry during 1958 and 1959 increased to about 40 percent. During the period of the First Five-Year Plan the policy framework was based on the Soviet model for the rapid buildup of heavy industry, and we will call this strategy the *heavy industry push* strategy. In the last half of 1956 and in the early part of 1957 there was considerable ambivalence and even criticism of this strategy on the part of the planners themselves. The draft proposals for the Second Five-Year Plan reflected this ambivalence by scheduling increases in production for industry involving a continuation of the rates of growth achieved for 1937-57 but at the same time calling

for the rate of investment to remain at the 1956-57 level. The two objectives could not possibly be consistent with each other. The Leap Forward policies made the draft proposals for the Second Five-Year Plan only a historical curiosity, but the problems being debated and considered were relevant both for the 1958-62 period and for investment policies in the 1960's. The device we will use is to make a hypothetical projection for trends in the economy if the heavy industry push strategy of the First Five-Year Plan had been continued in the 1958-62 period. The implications of such a projected trend will then be analyzed in terms of the key problems involved for rapid industrialization. In the following section we will then attempt to trace the actual course of events during the Leap Forward and its aftermath.

A. THE HEAVY INDUSTRY PUSH PROJECTION FOR 1962

Our heavy industry push projection to 1962 takes as its starting point levels of output in 1962 where the various sectors would increase at the rates achieved in the 1953-57 period. In this projection the economic sectors are grouped into three because each grouping involves sector interrelationships that would keep production in balance. The broad groupings are (1) agriculture, (2) the nonagricultural consumer sectors, and (3) the capital goods sectors—defined as heavy industry excluding handicrafts, construction including geological surveying and prospecting, and modern transportation. Table 6 presents the trends for 1953-57, and the hypothetical 1962 projection. The actual trend in agriculture was a sharp decline from 1957 levels in the 1960-61 years and nonagricultural consumptions sectors also declined in 1960-62 because of the lack of agricultural raw materials.

TABLE 6.—Income originating in 1952 prices

	1952	1957 ¹	Heavy industry push projection 1962 ²
Capital goods sectors:			
Billion yuan	7.28	18.02	44.60
Average annual rate of growth 1953-57, 1958-62 (percent)		19.9	19.9
Nonagricultural consumer goods sectors:			
Billion yuan	19.07	30.21	47.85
Average annual rate of growth 1953-57, 1958-62 (percent)		9.5	9.5
Agriculture:			
Billion yuan	39.30	44.10	49.50
Average annual rate of growth 1953-57, 1958-62 (percent)		2.3	2.3
Indirect taxes	4.47	8.65	13.25
Gross national product:			
Billion yuan	70.12	100.98	155.20
Average annual rate of growth 1953-57, 1958-62 (percent)		7.5	9.0

¹ For the methodology for these estimates see the appendix.

² Same rate of increase for all sectors as for 1953-57 with indirect taxes the same proportion of GNP as in 1957.

Given the 1962 projection on the heavy industry push strategy, we need some further estimates to give us a complete picture of the full implications of the projection. In table 7 we present some aggregate input-output relationships for heavy industry and the construction sectors in 1957. The estimates differ from those involved in table 6

because they are in 1957 market prices and not 1952 factor prices and handicrafts output is included in heavy industry. We assume that the proportion of such output in handicrafts remains constant, and this permits us to convert these estimates into 1952 prices whenever we wish. The gross value of heavy industry consists of three categories: (1) Intrasector sales including current costs of production and additions to inventories; (2) sales to trade and light industry either as producer goods for agriculture, raw materials for light industry, or consumer durables going to households and government, and sales to the military establishment; (3) sales of investment goods including building materials and machinery and equipment to the construction sector for fixed investment.

In making the projection to 1962 we make the safe assumption that intrasector sales remain a constant proportion of gross output. For the sales to all sectors except the capital goods sectors, the judgment is made that these sales could at the most increase at about 15 percent a year reaching levels in 1962 double the 1957 levels.

This rate of increase is slightly below the 17-percent rate for the 1953-57 period, but is considered the optimum rate given the limitations to be expected on increases in these sales. The first limitation operating for this category of sales is the potential rate at which new technology can be introduced into industries supplying such items as military equipment and chemical fertilizer. The process of training the technicians needed and of organizing and introducing new production processes has its own time dimension operating even if the planners should give top priority to heavy industry production in these industries. The second limitation operating with respect to this category of sales by heavy industry is the tendency to hold to traditional patterns of consumption both by planners and by the population. The traditional living standards are geared to agricultural production and the land. Even in industries supplying materials for housing construction or bicycles and consumer durables not subject to the limitations discussed above, the holding to traditional patterns of consumption means that their production will increase more rapidly perhaps than that of consumer goods dependent on agriculture for raw materials but still below the technologically feasible rate of increase because consumption patterns are changing only gradually over time.

With the estimates of sales in 1962 to all other sectors except to the construction and transportation sectors, we have the projected flow of investment goods as a residual. In turn total sales of the construction sector—*i.e.*, all fixed investment other than self-financed agricultural investment—can be taken to be in the same proportion to available investment goods purchased in 1962 as estimated for 1957. The additional estimate required is the trend in imports of investment goods, nearly all of which go into investment in the capital goods sectors. We assume that imports of these goods will expand at the same rate as for the nonagricultural consumption sectors. Table 7 makes the projections for heavy industry sales in 1962.

Given the projections in tables 6 and 7, the pattern of final expenditures for 1962 can be roughly estimated. Fixed investment in 1952 prices is given in table 7 at 50.6 billion yuan or 32.6 percent of the

TABLE 7.—Heavy industry (including handicrafts) and construction, billion 1957 yuan in market prices

HEAVY INDUSTRY				
Sector	1957		Purchases	Heavy industry push 1962 projection sales
	Purchases	Sales		
Heavy industry	9.0	{ 9.0 2.7 }		24.0
Trade	2.3	{ 1.5 1.5 }		3.0 3.0
Light industry and households		1.7		3.4
Government (military)		2.5		5.0
Construction		7.7		22.5
Income originating	11.5			
Gross sales and purchases	24.6	24.6		60.9

CONSTRUCTION				
Sector	1957		Purchases	Heavy industry push projection 1962 sales
	Purchases	Sales		
From abroad	2.9		4.4	
From heavy industry	7.7		22.5	
Modern transportation .....	.8		2.0	
Income originating	4.6		11.7	
Gross sales and purchases	16.0	16.0	40.6	40.6
			Fixed investment	
Self-financed agricultural investment			2.8	5.6
Total fixed investment in 1952 prices:				
Construction			17.9	45.4
Agriculture			2.6	5.2

¹ Residual.

² Inventories.

³ For agriculture.

⁴ Consumer goods.

⁵ Includes purchases from, less sales to, transportation sector of 1.8 billion yuan.

projected 1962 GNP in table 6. This is far above the 20 percent figure in 1952 constant prices for 1957. Assuming that repayments on Soviet loans would be as shown for 1959 in table 1 (0.5 billion), that inventories would increase in proportion to GNP (9.1 billion) and that government purchases would also increase in proportion to GNP (14.2 billion), we get an estimate for the supply of consumer goods and services in the 1962 projection as 80.8 billion yuan.

1. THE HEAVY INDUSTRY PUSH PROJECTION AND CONSUMPTION LEVELS

Given the projected level for consumption in 1962, the first key problem in the heavy industry push strategy for 1958-62 can be identified. This policy-framework is modeled on the Soviet pattern for rapid industrialization, but the Soviet economy in 1928 before the first two Russian Five-Year Plans had a much higher level of per capita consumption than exists in China. The rural living standard in Soviet

Russia was probably twice that of China's peasantry in 1953-57. Our estimates and those of other scholars all indicate that per capita consumption in rural areas in the 1953-57 period did not improve but neither did they decline. In the circumstances prevailing in 1957, moreover, the Chinese Communist leaders could not adopt the Stalinist solution of increasing the flow of agricultural output to the rising urban labor force by reducing rural living standards below the 1957 level. It is true that in actual fact rural living standards in the 1960-64 period fell well below the 1957 level, but the Communist leadership could not meet this situation by pressing forward with industrialization. They could only meet this situation by reducing the urban living standard proportionately. Even if agricultural output could have increased at the 1953-57 rate as shown in the heavy industry push projection, rural consumption as a percentage of agricultural income could hardly fall below the 1957 level in the period 1958-62 without jeopardizing the postulated increase in agricultural output. Economic factors and political considerations combine to justify the view that rural consumption in the 1958-62 period would remain at least as large a share of agricultural income as in 1953-57.

Just as trends in agricultural output set limits to the rate of urbanization, trends in modernizing the nonagricultural labor force generate upward pressures on real wages for the workers acquiring the necessary skills in the modern sectors. Trends in urban consumption will tend to be a function of the growth of the labor force in the modern sectors. The hypothesis presented here is that the normal relationship of output to wages in the nonagricultural sectors is that labor's share in each industry remains a constant percentage of total income originating. But the modern sectors with higher amounts of capital per worker will tend to have a lower share for labor than more traditional occupations. Labor's share for all the nonagricultural sectors will tend to fall only because the more modern sectors with lower shares for labor are growing more rapidly than trade and handicrafts where labor's share is much greater.

Our measure, therefore, of the burden on desired consumption trends imposed by rapid industrialization will be the extent to which labor's share in each industry in the nonagricultural sectors remains a constant percentage of total income originating. There was some lag in the 1953-55 period in industrial wages in relation to increases in productivity, but with the wage adjustments of 1956 this lag seems to have been corrected. A comparison of 1952 and 1956 wage bills for industry excluding handicrafts, for example, against labor force in industry and budget data on profits and taxes show that if anything wages increased slightly as a percentage of income originating in current prices. The hypothesis warrants much more investigation, but a brief examination of the data leads us to believe that labor's share in each industry remained remarkably constant throughout the 1953-57 period.

Many will disagree with the estimates on which this judgment is based, but even those coming to a different conclusion about the 1953-57 period would probably be willing to use this assumption as a yardstick for determining the burden of the heavy industry push program on desired consumption standards. In our projection, industries in

each of our broad groupings were growing and could be expected to grow at about the same rates, and so we can extend our assumption to the aggregate share of income in these groupings going for wages. Using some rough percentage estimates for labor's share in each grouping in the 1953-57 period, table 8 presents the trends involved for 1958-62.

Table 8 shows that the assumptions for 1952 and 1957 with respect to constant shares in sectors conforms closely to estimated consumption levels. With the projected trend for 1962 and if agricultural consumption continued at the 90-percent-of-income figure, urban consumption in 1962 would be running at about 45 percent of total consumption. This percentage is hard to achieve in the Chinese economy. The proportion of agricultural output marketed in the years 1952 through 1957 was always in the 31- to 33-percent range. Urban consumption for the 1953-57 period was pressing increasingly on this traditional barrier to expanding the nonagricultural labor force. The problem of increasing the farm surplus would be a tremendous problem if the projected trend in urban consumption were achieved.

TABLE 8.—*Billion 1952 yuan*

	1952	1957	Hypothetical heavy industry push, 1962
Rural consumption at 90 percent of agriculture income.....	35.37	39.69	44.
Actual rural consumption, 1953 and 1957 and projected for 1962..	35.65	41.73	44.
Capital goods sectors: Wages at 35 percent of income originating.....	2.55	6.31	15.
Nonagricultural consumer goods sectors: Wages at 60 percent of income originating.....	11.44	18.13	28.
Total urban consumption desired.....	13.99	24.44	44.
Consumption supplied: Urban consumption estimated and projected.....	13.90	24.0	136.
Total consumption estimated and projected.....	48.55	65.33	80.
Urban consumption as a percentage of total consumption.....	28.5	36.8	44

¹ Residual.

Table 8 shows that wage and price policies for 1953-57 could be continued for 1958-62 only if urban consumption increased to more than 50 percent of total consumption. With 45 percent of total consumption for the urban population, the level of real wages in 1962 would have to be held down by state policies to about 80 percent of the average increase in labor productivity in the nonagricultural sectors. If the hypothesis advanced is correct and there are strong forces operating in the course of economic development to keep labor's share of output constant in each sector, such downward pressure on wage rates would require policies for restricting consumption in the urban areas—restrictions much more repressive than those imposed during the 1953-57 period. Furthermore, these policies would have important political and social consequences.

The key set of policies involved in reducing the gap between desired consumption levels and available consumer goods and services produced would have to be directed at slowing down the rate of urbanization that was occurring in the 1950-57 period. A reduction

in the rate of increase in production that would ease the strains of urbanization would have to be directed not at the consumer sectors but at the increase in output in the capital goods sectors. With respect to our problem of capital formation in relation to such a set of policies, the key step would have to be holding all fixed investment other than self-financed agricultural investment at the 1957 level throughout the 1958-62 period. Table 9 traces the implications of such a consumption-oriented policy framework, and shows that this far-reaching decision would indeed reduce the increase in industrialization down to a level that would permit the wage and price policies of 1953-57 to continue throughout the 1958-62 period. The problem then becomes one of determining whether the level of fixed investment that would result would be sufficient to support the increases in output projected for the consumption sectors.

TABLE 9.—*Consumption-oriented projection for the capital goods sectors*

[Billion 1957 yuan]

HEAVY INDUSTRY

	1957	1962
Total final sales:		
To trade, light industry, and military.....	7.2	14.4
To construction sector.....	7.7	6.2
Total.....	14.9	20.6
Index.....	100.0	138.3

CONSTRUCTION

Total purchases:		
Imports.....	2.9	4.4
Heavy industry.....	7.7	6.2
Total.....	10.6	10.6
Index.....	100.0	100.0
Income originating in 1952 prices:		
Heavy industry.....	7.62	10.54
Construction.....	5.20	5.20
Modern transportation index as for heavy industry.....	5.20	7.19
Total.....	18.02	22.93
Index.....	100.0	127.2
Consumption desired as in table 8:		
Capital goods sectors.....		8.03
Nonagricultural consumer sectors.....		28.71
Agricultural sector.....		44.55
Total.....		81.29
Total consumption as projected.....		80.80
Difference.....		.49

2. THE HEAVY INDUSTRY PUSH PROJECTION AND INVESTMENT REQUIREMENTS

One further step is needed to complete our picture of the hypothetical heavy industry projection. In table 7, we secured estimates of total fixed investment in 1962, and we need to determine the sector allocations of this investment that might be expected on the projection. We will simply sketch the results of a much more detailed

analysis of the trends actually occurring in the 1953-57 period and the basis for making projections of levels of fixed investment in 1962. For the 1953-57 period we used as a guide data on labor force,⁹ income originating in 1952 prices, and official data on fixed assets for the various sectors. These figures for fixed assets involve estimates of the value of pre-Communist capital in the various sectors revalued in 1950-51 prices plus all additions to fixed assets without subtraction for depreciation. This data is far from reliable but is adequate as a basis for projecting future trends if past trends are continued. Table 10 presents the projected sector allocations for fixed investment.

TABLE 10.—Sector allocations of fixed investment on the heavy industry push projection

[Billion 1957 yuan]

	1957	1962
Sales by construction sector:		
For consumption sectors:		
Agriculture ¹	2.0	(4.0)
Light industry and trade ²	1.5	(3.7)
Nonagricultural consumer services sectors ³	3.9	(10.2)
Total consumer sectors.....	7.4	17.9
For capital goods sectors.....	8.6	⁴ 22.7
Of which heavy industry ⁵	(5.5)	(14.8)
Total fixed investment by construction sector.....	16.0	40.6
Self-financed agricultural investment.....	2.8	5.6

	Percent		
	1957	1959	1962
Percent of fixed investment:			
Heavy industry.....	29.3	40.6	32.0
Agriculture.....	25.5	28.5	20.8
Light industry and trade.....	8.0	7.0	8.0
Nonagricultural consumer services.....	20.5	12.5	22.0

¹ 1962 level twice that for 1957 as for self-financed agricultural investment.

² Based on the same increase in the capital-output ratio for the 1957-61 period as for 1953-56.

³ For government, education, and health based on absolute average annual increments as in 1953-56. For urban housing, urban public utilities, and communal services, the 1953-56 data show these fixed assets increased in direct proportion to the number of workers in the modern sectors. Based on the same trends in output per worker as in 1953-57, the number of workers in 1962 in the modern sectors was projected. For the required fixed assets only one rate of increase in investment would generate this level of fixed assets in 1962 and this gives us the projection for investment in these sectors.

⁴ Residual.

⁵ For 1962 it is assumed that heavy industry investment would be the same percentage of investment in the capital goods sectors as in 1957.

The projections shown in table 10 give the heavy industry push projection some features missing from the sector allocations in the 1958-59 years. First, investment in modern transportation is judged to remain a constant proportion of heavy industry investment. The Leap Forward push departed from this policy only to show that this policy was mistaken, and by 1960 the planners were moving to redress the balance in favor of modern transportation. The projection for social overhead capital in support of the growing labor force in the modern sectors indicate a slight increase in the proportion of investment in these categories. This is because urban living standards are presumed to remain at the 1957 level instead of the Leap Forward

⁹ John P. Emerson, *Non-Agricultural Employment in Mainland China: 1949-58* (International Population Statistics Reports, Series P-90, No. 21).

emphasis that involved a drastic decline in urban living standards in the face of a huge increase in the nonagricultural labor force. The 1959 investment in agriculture was pushed to a much higher level than in the projection for 1962, but again hindsight justifies the conclusion that this effort exceeded the possibilities for an efficient and high-quality production of producer goods for agriculture given the potential of heavy industry in these years.

With the projections shown in table 10, we can now make a most important check on the consistency of the heavy industry push projection. For every level of gross fixed investment sales by the construction sectors the 1957 price relationships show that sales of investment goods either from imports or domestic production will be two-thirds of this amount. The 1953-57 experience shows that gross fixed investment in heavy industry is about 40 percent higher than additions to fixed assets because of construction work in progress, major repairs, and other expenditures that are not included under additions to fixed assets. These relationships mean that for the projected level of total output and the pattern of demand for heavy industry output certain definite amounts of capital for heavy industry will be created. In the heavy industry push framework pressures will be put on producers in heavy industry to make maximum use of the capital available to them. An analysis of the 1953-56 period shows that the capital-output ratio for heavy industry was quite stable. There might be tendencies for rising real costs increasing the capital-labor ratio, but these tendencies were almost entirely counterbalanced in the 1953-57 period by technological progress operating to increase labor productivity in direct proportion to the rise in the capital-labor ratio. Technological progress in the 1958-62 period would be even greater than in the 1953-57 period. Our judgment, therefore, is that when capacity is being fully utilized the capital-output ratio would remain at the 1957 level throughout the 1958-62 period. This gives us our measure of the sales that producers would wish to supply for any level of fixed assets made available to them. Nothing in the projections we have made would guarantee a balance between projected sales together with the proportion planners decide to plow back into investment in heavy industry, and the sales that would be desired by producers to maximize output. Table 11 presents the estimates of demand for heavy industry output on the heavy industry push projection and the supply by heavy industry producers if they are to maximize their output.

Table 11 shows an excellent balance between the flow of heavy industry output plus imports of investment to goods for further expansion of heavy industry and the level of output desired by producers if they are to maximize their supply of goods given the additional capital supplied them. There would be a small but persistent tendency to overfulfill production targets, but only in amounts sufficient to maintain the tension between the demand for heavy industry set by the planners and the pressure on producers to make the most of their productive fixed assets.

In spite of the completely consistent picture shown in table 11 in terms of the balance of investment being plowed back into the capital goods sectors and the increase in final sales of heavy industry if the

TABLE 11.—*Heavy industry push projection sales; of heavy industry plus imports of investment goods*

[Billion 1957 yuan]

Sales	1957	1958	1959	1960	1961	1962
To other sectors except construction.....	7.20	8.27	9.51	10.92	12.55	14.40
To construction for investment in consumption sectors.....	3.76	4.47	5.30	6.30	7.49	8.90
To construction for investment in capital goods sectors.....	5.70	6.92	8.40	10.19	12.36	15.00
Social overhead investment for workers in capital goods sectors ¹	1.14	1.38	1.68	2.04	2.47	3.00
Total projected sales:						
Imports.....	2.90	3.15	3.41	3.70	4.01	4.40
Domestic.....	14.90	17.89	21.48	25.75	30.86	36.90
Desired level of domestic sales by producers ²	14.90	18.00	21.85	26.52	32.19	39.06

¹ Based on the 1953-57 years, sales for social overhead capital in this category was 20 percent of the amount of sales for plowback investment in the capital goods sector.

² The desired level of sales by producers is based on the 1953-57 experience where the capital-output ratio was relatively stable allowing for a half year lag before fixed assets get into full production. The 1956 yearend figure for productive fixed assets in heavy industry was 18,740,000,000 yuan, and for this level of fixed assets producers were quite satisfied to produce the 1957 output where final sales were 14,900,000,000 yuan. The desired fixed assets-final sales ratio, therefore, is 1.26. On the other hand, for every yuan of investment goods either produced domestically or imported sold for investment in the capital goods sectors 65 percent would be allocated for heavy industry itself. Given the price relationships as shown in table 7, gross fixed investment would be 1.5 times this value for sales. On the other hand, gross fixed investment for heavy industry and for the capital goods sectors generally is 40-percent higher than additions to fixed assets because of major repairs and construction work in progress. Therefore, for every yuan of sales either from domestic output or imports for investment in the capital goods sectors we have 0.7 yuan in additions to the fixed assets of heavy industry. The desired increase in sales of heavy industry will be $\frac{1}{1.26} \times 0.7$ or 0.556. Since every yuan of final sales either from domestic output or imports will lead to a desired increase in sales by 0.556 of this amount in the following year, we secure the desired level of sales as shown.

new capital generated is to be fully used, the rationale of the projection is far from clear. The proportion of total available final sales of heavy industry plus imports being plowed back into further expansion of heavy industry can be roughly estimated for 1952 as 19 percent. Table 11 shows that this proportion rises from 32 percent in 1957 to 36.3 percent in 1962. The effort in the 1953-57 period was to emphasize the machine to build more machines industries, and for the 1953-57 period, we could argue that some increase in the proportion of output plowed back into heavy industry itself should take place. But on what conceivable basis could planners plan on expanding heavy industry output in terms of a gradual but steady increase in the proportion of output being plowed back into the productive capital of heavy industry itself. Our projection for heavy industry involves a high-priority effort to build up the military power of Communist China given the technological limitations involved and a high-priority effort for agriculture given the technological and institutional limits for an effective flow of goods from heavy industry. Unless a priority were given to raising urban living standards and a dedicated effort were undertaken to increase the living standards in terms of consumer durables and housing far in excess of the traditional consumption pattern, the projected level of support by heavy industry for the consumption sectors can only be as projected in tables 10 and 11. In fact, the potential of heavy industry for supporting the modernization of the Chinese economy would be increasing rapidly if the projected levels for heavy industry support of the consumption sectors would be achieved. And yet we have a situation for the heavy indus-

try push projection where progressively more resources are committed to the further expansion of heavy industry output.

It could be argued that as the heavy industrial base expands, there must necessarily be an increasing degree of "roundaboutness" to support the flow of goods to the rest of the economy. But this thesis is not convincing. The projected increase in the modernizing potential of heavy industry is already far above trends in production in the nonagricultural consumer sectors and even further above trends in agricultural production. The author has every sympathy with the objective of the rapid buildup of heavy industry as long as this buildup increases the potential for supplying goods embodying the latest technology to the rest of the economy at the optimum rate. The choice between military goods, including nuclear weapons, as against chemical fertilizer and goods in support of consumption, involves relative priorities set by the planners that we regret. But given the optimum rates of increase for the support of heavy industry to final uses, what conceivable basis can there be for setting some *a priori* increase for heavy industry that is more than is needed to support all final uses other than for investment in heavy industry itself? The implicit assumption of the heavy-industry-push approach is that at any given level of output for heavy industry that the product mix can always be shifted in whatever direction the planners wish. We can see no basis for this assumption whatsoever. The product mix of heavy industry at some future date will be determined by the allocation of investment in the years preceding this date, and there is simply no justification for setting production targets for 1962 or any other year where the machine industries or steel industries or any other heavy industry will be producing to expand the capacity of heavy industry at a faster rate than needed to support the flow of heavy industry output in support of the sectors using the output of heavy industry.

What would be involved if the planners should decide to shift their objectives from heavy industry as an end in itself to the potential for modernizing the rest of the Chinese economy? This question can best be answered by setting the input-output matrix for production in heavy industry against final sales to all other sectors, and maximizing output for sales to the other sectors and minimizing the inputs into heavy industry itself to secure those rates of increase for sales to the other sectors. All that can be done in this discussion is to approximate the correct pattern of final sales for heavy industry. A reasonable approximation to such a solution is probably to take as our first magnitude the optimum increase of final sales of heavy industry to all other sectors. For this increase in sales the capacity of heavy industry would have to increase by some amount to support this increase. After subtracting the increase in this capacity supported by imports, domestic sales of investment goods for capital goods investment can be calculated. For the probable increases in such sales from domestic output, an additional amount of investment will be required. A demand-oriented strategy for heavy industry would probably be as shown in table 12.

Our approximation for the pattern of final sales by heavy industry given a demand-oriented strategy shows that the proportion of heavy industry final sales plus imports that should be plowed back into the

TABLE 12.—Demand-oriented strategy projection for heavy industry sales

[Billion 1957 yuan]

Sales	1957	1958	1959	1960	1961	1962	1963	1964
To other sectors except construction.....	7.20	8.27	9.51	10.92	12.55	14.40	16.55	19.02
To construction for investment in consumption sectors.....	3.76	4.47	5.30	6.30	7.49	8.90	10.57	12.56
To construction for investment in capital goods sectors:								
Sales for direct support of sales for other sectors ¹	3.20	3.73	4.34	5.08	5.87	6.88	8.03	-----
Imports.....	2.90	3.15	3.41	3.70	4.01	4.35	4.72	-----
Domestic sales.....	.30	.58	.93	1.38	1.86	2.53	3.31	-----
Additional sales for capital goods investment ¹.....	.50	.63	.81	.86	1.21	1.40	-----	-----
Total sales for investment in capital goods sectors.....	3.70	4.36	4.85	5.94	7.08	8.28	-----	-----
Social overhead investment for workers in capital goods sectors ².....	.74	.87	.97	1.19	1.42	1.66	-----	-----
Heavy industry push sales for investment in capital goods sectors ³	5.70	6.92	8.40	10.19	12.36	15.00	-----	-----

¹ As for table 11, the increase in sales producers wish is equal to 0.556 of sales of investment goods for the capital goods sectors, and so sales of investment goods in response to increases in sales to the other sectors

will be $\frac{1}{0.556}$ or 1.8 times such increases. The planners will wish to schedule additional investment goods sales to support that portion of direct support sales to be supplied domestically.

² As in the other projection, investment in housing, communal facilities, and urban public utilities for workers in the capital goods sectors can be estimated at 20 percent of sales for investment in the capital goods sectors.

³ From table 11.

capital goods sectors for expanding heavy industry capacity would be 24 percent in 1957 and 25 percent in 1962. If the demand-oriented approach had been adopted for the period of the First Five-Year Plan heavy industry output would have increased at an average annual rate of 16.4 percent rather than the 19.9 percent actually achieved. The proportion of output plus imports plowed back in to the capital goods sectors would have increased from 19 to 24 percent and not to 32 percent achieved because of the heavy industry push strategy. Furthermore, the process of modernizing the economy would be proceeding as rapidly as in the heavy industry push projection.

In 1957, therefore, the Communist planners could very well have adopted a demand-oriented set of policies for the 1958-62 period. The key policy for the demand-oriented strategy would be to hold investment in the capital goods sectors at the 1957 level through 1962. The total investment needed as shown in table 12 for the 6 years 1957-62 equals 34.2 billion yuan in sales of investment goods for these sectors. This is exactly the amount that would be supplied if the 1957 level were maintained through 1962. There would be some excess capacity in earlier years, but by the end of 1962, the proper balance between plowback investment and final sales to other uses would be achieved. We then have our third policy-framework projection for the 1958-62 period as shown in table 13.

Table 13 shows that a demand-oriented strategy would take a giant stride toward easing the strains of industrialization and at the same time continuing the vital process of modernizing the economy. More than 60 percent of the gap between consumption desired and supplied would be removed by holding fixed investment in the capital goods sectors at the 1957 level for the 1958-62 period. This demand-oriented policy would mean that the capital goods sectors would be growing at

TABLE 13.—Demand-oriented projection for capital goods sectors

[Billion 1957 yuan]

HEAVY INDUSTRY

	1957	1962
Total final sales:		
To trade, light industry, and military.....	7.2	14.4
To construction sector.....	7.7	11.3
Total.....	14.9	25.7
Index.....	100.0	172.5

CONSTRUCTION

Total purchases:		
Imports.....	2.9	4.4
Heavy industry.....	7.7	11.3
Total.....	10.6	15.7
Index.....	100.0	148.1
Income originating in 1952 prices:		
Heavy industry.....	7.62	13.14
Construction.....	5.20	7.70
Modern transportation.....	5.20	8.97
Total.....	18.02	29.81
Index.....	100.0	165.4
Consumption desired on assumptions in table 8:		
Capital goods sectors.....		10.43
Nonagricultural consumer sectors.....		28.71
Agriculture.....		44.55
Total.....		83.69
Total consumption supplied.....		80.80
Difference.....		2.89
Heavy industry push projection.....		8.07

10.6 percent a year for 1958–62 period. Gross fixed investment by 1962 would not be the heavy industry push percentage of 32.6 percent of gross national product but rather 22.7 percent—close to the 20.3 percent for 1957.

Any further step toward reducing the strains of urbanization would involve holding investment in direct support of the consumption sectors at the 1957 level, and this would require an important shift away from capital-intensive methods of production in light industry. A policy aimed at increasing rural handicrafts output and to a much lesser extent urban handicrafts production at the expense of modern and large-scale light industry processing agricultural products would be needed to carry such a policy through. The reduction of investment requirements would operate partly through lowering average capital-output ratios for light industry output instead of raising them, but mainly by reducing the social overhead capital requirements for the labor force in these sectors. In this way the necessary production of nonagricultural consumer goods could be maintained and the level of investment in the consumption sectors reduced enough to achieve the objective. A reduction in social overhead capital, of course, means reduced house rent and urban consumer services, but the capital-output ratio is so high for these sectors that consumption would not be reduced by enough to justify adjustments in the totals.

CAPITAL FORMATION AND THE ACTUAL TRENDS SINCE 1957

In the last section we discussed the alternative policy frameworks that could have been adopted in 1957. We now turn to the actual course of events in the years since 1957. The Leap Forward strategy adopted in the 1958-60 years in our frame of reference is simply the heavy industry push strategy carried far beyond the framework established during the 1953-57 period. We have argued that the 1953-57 framework if followed in the 1958-62 period would imply a rate of urbanization that would put serious new strains on wage and price relationships. The Leap Forward strategy was based on the confident expectation that mass mobilization of rural labor for irrigation and a sharp increase in the flow of producer goods to agriculture would create an agricultural breakthrough, sharply increasing agricultural production beyond the rate of growth achieved for 1953-57. The agricultural surplus would, therefore, increase so much that even a Leap Forward rate of industrialization could be achieved. Furthermore, the Leap Forward strategy by stressing both large-scale and small-scale production methods and by glorifying the solidarity of all laborers blurred the distinction between workers in the modern sectors and workers in the traditional sectors.

The new strategy was striking at the whole trend involved in the First Five-Year Plan strategy—oriented as it was toward building up a skilled and disciplined labor force in the modern sectors as rapidly as possible while workers in the traditional sectors were to find some supporting role in the pattern of development. In fact, the Leap Forward strategy with the establishment of the communes and the campaigns to send students and urban workers to rural areas was aimed not only at abolishing the distinction between nonagricultural workers in the modern and the handicrafts sectors, but at the whole distinction between peasants and urban workers. In this context the Leap Forward strategy was aimed at all-out industrialization without any corresponding increase in the urban population simply because there would no longer be any distinction between workers in any occupation and output would expand as a result of a general upsurge in labor productivity in all sectors simultaneously. Wage differentials would be sharply reduced in the new psychology of peasant-worker solidarity. The investment in social overhead capital for workers developing skills in modern and more technical lines of production could be minimized in favor of investment in support of productive facilities.

In the aftermath of the Leap Forward when sharp declines in agricultural output in 1959-61 below 1957 levels showed that the agricultural surplus was going to fall below the 1953-57 levels, the leadership certainly could not press for all-out industrialization and had every reason to continue its political drive to abolish as many of the distinctions between peasant and worker as possible. The general consequence of continuing this part of the Leap Forward strategy would be to hold the rate of urbanization down as much as possible and lessen the pressure for increasing real wages for workers in the modern sectors as an incentive for increases in skills and disciplined effort.

The second main problem for the heavy industry push strategy was the tendency for heavy industry output to become an end in itself as an increasing portion of output was plowed back into further expansion of heavy industry irrespective of trends in the flow of heavy industry output to the other sectors. This limitation only operates if planners retain in some measure the idea that the objective of building up heavy industry is an increase in the capability of heavy industry to support the modernizing of the rest of the economy. The Leap Forward strategy took the heavy industry push approach far beyond the limits discussed because production targets for steel and other items were glorified as true indicators of industrial progress. In other words, the Leap Forward effort for heavy industry became progressively less rational as it proceeded.

We can easily adapt our heavy industry push projection, shown in table 11, for a Leap Forward projection based on the actual trends in 1958-59, some scattered indications for 1960, and a hypothetical 1961-62 period if the Leap Forward had run its course. Our first modification is in the level of imports for investment goods to be plowed back into the capital goods sectors. The Leap Forward effort pushed these imports far above our projected trend. Our first adjustment is to use the actual figures for 1958-60 for these imports, but we will assume that the 1961 and 1962 levels would have had to return to our projected levels because of limits in securing the necessary foreign exchange even if the agricultural difficulties and the Sino-Soviet dispute had not occurred. Second, the heavy industry push projection shows sales in support of consumption sectors increasing at an average annual rate of 16.7 percent. The 1958-59 experience shows an average annual rate for the 2 years of 19.8 percent. There is no question that this rate of increase was not viable, but our wish is to trace the Leap Forward to a successful completion by 1962, and so the 19.8 percent rate will be used. Third, the heavy industry push projection was based on the judgment that investment in modern transportation in particular would be such that heavy industry investment as a percentage of total investment in the capital goods sectors would remain at the 1957 level of 65 percent. The Leap Forward strategy pushed this percentage far above 65 percent in the 1958-59 years and for 1960 as outlined in the 1960 plan. All the evidence shows that this investment policy was a mistake because the transportation network was under increasingly severe strains during the 1958-60 years, but we will also use the 1960 percentage for 1961 and 1962. Our fourth and final modification represents a single Leap Forward injection of effort in 1958 in which tremendous pressure was put on workers in large-scale heavy industries for overtime and extra effort, and large numbers of handicrafts people were pressed into the production of producer goods.

This Leap Forward injection decreased the capital-output ratio well below that of 1957 representing a level of sales well above the normal use of capacity. By 1959, however, the policymakers were trying to bring the Leap Forward effort in heavy industry into some semblance of order and the record shows that by 1959 the problem was to bring up production to a full utilization of the rapidly expanding capacity of heavy industry. For the years 1959 through 1962, therefore, we can simply maintain the capital-output ratio at the 1957 level.

With these five assumptions our projection for the Leap Forward strategy can be made. Table 14 presents the growth path for heavy industry involved.

The projected level of output in 1962 in the Leap Forward projection is 399.2 percent of the 1957 level for an average annual rate of increase for the 5-year period of 31.9 percent. Of course, the projected trend could not possibly have occurred. Even without the difficulties in agriculture and the termination of Soviet aid, the projected trend involved severe imbalances in heavy industry because steel output was in excess of possible uses and other input-output imbalances were developing. The labor requirements would also have been clearly excessive. But supposing these limitations had not operated and the projection had gone through in 1960-62 as shown in table 14. The proportion of domestic output plus imports plowed back into the capital goods sectors would have increased from 32 percent in 1957 to 52 percent in 1962. Of the total increase in domestic sales, 63 percent would be for plowback sales into the capital goods sectors. The Leap Forward plowback propensity in 1962 is double the proportion estimated for the demand-oriented strategy outlined in table 12.

The Leap Forward set as its goal overtaking the United Kingdom in the value of industrial output by 1967, and the whole logic was to expand heavy industry output so as to overtake the most advanced industrialized countries. If the industrialization goal is conceived as production in the form of chemical fertilizer, airplanes, and all other items flowing to the rest of the economy, that might be justified. But if the goal is to expand heavy industry as rapidly as possible without any reference to the modernizing potential involved, this could best be achieved by holding down the flow of goods to the rest of the economy

TABLE 14.—*The Leap Forward heavy industry projection, final sales of heavy industry plus imports of investment goods*

[Billion 1957 yuan]

	1957	1958	1959	1960	1961	1962
To other sectors except construction ¹	7.20	7.70	10.22	21.41	25.66	30.73
To construction for investment in consumption sectors ¹	4.90	6.60	7.65			
To construction for investment in capital goods sectors ²	5.70	11.80	13.98	18.55	23.73	33.11
Heavy industry.....	(3.60)	(8.78)	(10.43)	(12.99)	(16.61)	(23.18)
Total sales:						
Imports ³	2.90	4.94	6.20	5.63	4.01	4.35
Domestic sales.....	14.90	21.06	25.65	34.33	45.37	59.49
Sales desired by domestic producers ⁴	14.90	18.00	25.46	34.33	45.37	59.49
Leap Forward effort.....	0	3.06	.19	0	0	0

¹ For 1957-59 based on index for total heavy industry output from Liu and Yeh (Liu and Yeh, *op. cit.*), less sales for investment from estimates in this study. For 1960-62 based on the 19.8 percent a year increase for 1958-59.

² Total investment in capital goods sectors based on our estimates for 1957-59. For 1960-62, such investment is the residual. The proportion of total investment in these sectors for heavy industry is based on the actual record for 1957-59. The 1960 plan scheduled investment indicates that heavy industry would be 70 percent of planned investment in the capital goods sectors, and this percentage is used for 1960-62.

³ Based on the 1957 estimate against trends in these imports as shown in Eckstein's data for foreign trade; Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade*, (New York; McGraw-Hill Book Co., 1966).

⁴ Sales desired by producers taken to be always in the ratio of $\frac{1}{1.26}$ of fixed assets. Fixed assets added taken to be $\frac{1.5}{1.4}$ of final sales for investment in heavy industry (see table 11). Therefore for every level of sales by heavy industry or imports plowed back into heavy industry, the increase in the desired level of sales will be 0.85 of plowback sales.

to the level of imports, plowing back 100 percent of domestic sales into the capital goods sectors. Given the capital-output ratio and the 70-percent figure for heavy industry investment as a proportion of capital goods investment, total heavy industry output could then grow at the rate of 60 percent a year, almost twice the Leap Forward rate. Such an effort would clearly be absurd, but the Leap Forward effort was well on the way toward such an absurdity.

The experience of the Leap Forward seems to have acted as a kind of catharsis removing from the leadership any tendency to look at heavy industry as an end in itself. Both from necessity and from bitter experience, the policymakers are now following what we have called a demand-oriented policy toward heavy industry. This is the policy that has been operating throughout the 1961-66 period, and our next problem is to sketch out the implications. Such a shift in policy in itself would have led to enormous changes in 1961. Instead of the Leap Forward projection for 1961 in table 14, a shift to the demand-oriented policy framework as outlined in table 12 would have meant that sales of investment goods for plowback investment in the capital goods sectors would have been cut in half. Instead of sales of heavy industry increasing by about 32 percent as in table 14, sales in 1961 would have declined. But we must also take into account the fact that the demand-oriented policy was forced upon the planners because agricultural failures and the termination of Soviet aid affected the feasible level of final sales by heavy industry to the other sectors. Some of the Soviet aid projects were going into production to support the final sales for military purposes and other flows to the consumer sectors. It is safe to say that the heavy industry push projection for these sales would be the maximum feasible level for increases rather than the Leap Forward levels. With the declines in agricultural production investment in light industry and trade would fall drastically on the order of 80 percent of the 1960 level. With the overall decline indicated both for light industry and heavy industry the problem would be to reduce the labor force in the modern sectors rather than adding to them. The process of reversing the Leap Forward flow of workers into the nonagricultural labor force and moving large numbers back to the rural areas could not be pursued without freezing the social overhead capital of more established workers at 1960 levels. It is safe to say that investment in the nonagricultural consumption sectors in the 1961 situation would be reduced by something like 75 percent from the 1960 level. Agricultural investment was troubled by poor quality and inefficiency in production and would have to stay at the 1960 level.

With the events of the 1961-65 period we have huge amounts of excess capacity in heavy industry but in spite of this excess capacity it is probable that new investment would have to be undertaken to support increases in final sales. Our assumption is that only half of the increase in sales can be met by greater use of excess capacity, and the other half must require new investment. Table 15 presents a sketch of the trends in heavy industry in the 1961-64 period.

The sketch of trends as shown in table 15 is conjectural but the main conclusions are probably correct. Heavy industry output even by 1964 is still below the 1959 level and 70 percent higher than in 1957.

TABLE 15.—*Aftermath of the Leap Forward, heavy industry sales plus imports of investment goods*

[Billion 1957 yuan]

	1960	1961	1962	1963	1964	1965
To other sectors except construction ¹	12.24	12.51	14.40	16.55	19.00	21.85
To construction for investment in the consumption sectors ²	9.17	4.20	4.20	4.40	4.50	4.60
Total sales.....	21.41	16.71	18.60	20.95	23.50	26.45
To construction for investment in the capital goods sectors ³	18.55	1.70	2.12	2.30	2.66	-----
Imports.....	5.63	1.45	.72	.88	.88	-----
Domestic sales.....	34.33	16.96	20.00	22.37	25.28	-----
Domestic sales desired by producers ⁴	34.33	45.37	46.32	47.50	48.78	-----

¹ Final sales to other sectors for 1961-64 based on the trend projected for the heavy industry push projection.

² Gross investment in the consumption sectors estimated at 4,000,000,000 for agriculture and 1,900,000,000 for nonagricultural consumer service sectors for the years 1961-65. Light industry and trade at $\frac{1}{2}$ the 1960 level for 1961-62 rising gradually in 1963-65 with a shift toward synthetic fibers and other investment. Sales by heavy industry $\frac{3}{4}$ of investment sales.

³ Normal desired investment for increases in sales in next year would be 1.8 times these increases as in table 11 but half of this attained by use of existing excess capacity. Indirect investment also unnecessary because of very large amounts of excess capacity.

⁴ Desired level of sales based on maintaining the 1957 capital-output ratio for maximum utilization of industrial capital.

The underutilization of capacity shown is such that final sales by heavy industry would have to be 90 percent higher in 1964 to get back to the sort of pressure on producers to maximize output that existed during the First Five-Year Plan and during the leap forward. It is clear that there is absolutely no incentive on the part of the leadership to return to the heavy industry push model followed in the 1953-59 period. The whole system of production targets geared as they are to maximum use of industrial capital simply is not relevant for the 1960's. There is no likelihood that a heavy industry push policy framework will be resumed. If such a program were resumed it would only represent stupidity on the part of the Communist policymakers and not any indication of a successful solution to the economic problems of this decade.

The estimates for 1964 show total fixed investment in 1964 except for self-financed agricultural investment well below the 1957 level. This estimate is a little low but fixed investment was probably no higher than in 1957. This situation is possible first because the planners are investing in heavy industry only as needed to support final sales. This should have been the objective of the planners from the very beginning, and this paper has tried to show that the heavy industry bias simply absorbed economic resources beyond any possible justification. The level of investment shown for 1964 also can occur only because the planners have sharply reduced the rate of urbanization from early periods. The present peasant-worker alliance approach and the onslaught against intellectuals makes economic progress more difficult but it sharply reduces the amount of investment that is needed to build up the necessary social overhead capital in the cities to support rapid urbanization. This second investment policy is much more dubious than the demand-oriented approach to heavy industry. The first step releases economic resources for modernizing the economy. The second step puts the burden of modernization on a program for the whole population rather than specific training programs for selected groups of workers in the modern sectors.

Because the heavy industry push program has been terminated and the level of fixed investment sharply reduced, there is a tendency to arrive at wrong conclusions about the general state of heavy industry. Table 15 projects a very satisfactory rate of increase in the sales of heavy industry to the other sectors (exclusive of sales for investment). These increases in production have been in the form of heavy industry output substituting for petroleum and other commodities previously imported, in the flow of military equipment, and in the flow of chemical fertilizer and many other items that constitute substantial progress in economic development. The Communist leaders seem to have freed themselves of the tendency to identify increases in production of steel and other key commodities of heavy industry with success or failure in economic development. The central thesis of this paper is that observers of the China scene must also find new criteria for success and failure to replace those used in the 1950-59 period.

APPENDIX

SOURCES AND METHODS

Only a brief sketch of the methods and sources of the estimates of capital formation will be given here. Table A-1 summarizes the main components of the estimates for fixed investment. The bulk of fixed investment consists of state investment both within and outside the state plan comprising all completed capital construction expenditures undertaken by state, joint state-private, and cooperative enterprises exclusive of major repairs. Viewed in relation to statistics on many other sectors of the Chinese economy, the data on state investment are relatively reliable. The 1958 and 1959 figures may well be exaggerated, however, because of a weakening of state financial controls over construction expenditures. As table A-1 shows, all other estimates for fixed investment are simply supplementing and rounding out the estimates that would be secured by using the figures for state investment by themselves.

TABLE A-1.—*Main components of estimates of gross fixed investment, current prices*
[Billion yuan]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959.
State investment.....	1.13	2.35	4.36	8.00	9.07	9.30	14.80	13.83	26.70	31.70
Self-financed agricultural investment.....	1.00	1.30	1.50	1.80	2.20	2.40	2.90	2.80	5.70	6.30
Supplementary budget expenditures for agriculture.....	.08	.16	.35	.47	.97	.83	.99	.80	.69	.32
Nonagricultural investment by private enterprises and households.....	.34	1.20	1.36	1.41	.83	.34	0	0	0	0
Major repairs.....	.69	.76	.85	.91	1.05	1.05	1.18	1.34	.38	.41
Total fixed investment.....	3.24	5.77	8.42	12.59	14.12	13.92	19.87	18.77	33.47	38.73
Changes in inventories.....	2.85	5.70	6.15	5.86	5.28	5.22	— .18	6.64	10.80	10.41

The next most important component of fixed investment is agricultural investment not included under state investment. Most of this is financed by the agricultural population. Part of self-financed agricultural investment consists of imputed expenditures undertaken by agricultural households outside the market. These estimates are based on the same percentage of gross value of agricultural output as estimated for 1952 using sample studies of farm income and expenditures. The other portion consists of cash purchases of investment goods included under sales of producer goods to agriculture carried in the official data. Data on the breakdown of these sales by categories for 1953-55 is used to determine the proportion for investment as against inputs as costs of production. One category of agricultural investment included in table A-1 refers to budget expenditures for agriculture not included in state investment for operating expenses for personnel in the Ministries of Agriculture, Forestry, and Water Conservancy, expenses for promoting new techniques and new producer goods for

agriculture, and expenses for dike repairs. There are conceptual problems in including these expenditures and a danger of some double-counting against retail sales for producer goods to agriculture. Their exclusion would lead to an understatement of agricultural investment.

The remaining components of gross fixed investment are fixed investment by private enterprises and households in the nonagricultural sectors and major repairs both by state and nonstate agricultural enterprises. It would be most convenient to assume that nonagricultural investment other than major repairs was negligible, and a previous article by the author made this assumption. But data on fixed assets shows that private investment by productive enterprises did take place in the years through 1955. Moreover, the view that a monolithic state apparatus preempted economic activities so much as to prevent capital formation in private enterprises or households does not conform to our judgment about the economic trends in the years before 1956. As with all attempts to round out the estimates, a great deal of research on the data for fixed assets and on trends in production was required to arrive at estimates that do not greatly affect any conclusions to be drawn from trends in capital formation.

The estimates for major repairs are based on the data on fixed assets, some data on major repairs by state enterprises, and smaller percentages against fixed assets for nonproductive fixed assets. The depreciation figures shown in table 1 also involve data on depreciation allowances for state enterprises as a guide for estimating depreciation in the private sectors. For agriculture the same percentage of gross value of output is used as used by Liu and Yeh.¹ The depreciation charges including both major repairs and depreciation allowances that resulted are very close to the depreciation charges as estimated by Liu and Yeh, although our 1957 figure is somewhat higher.

Every procedure used for estimating fixed investment involved specific allocations of investment by sector except for state investment. For state investment sectors allocations are given in the "*Ten Great Years*" statistical compilation² for the years 1952-58. Budget data for 1950-51 and the 1959 plan for sector allocations of investment were used to round out the sector allocations for state investment. A comparison of data in the "*Ten Great Years*" for the proportion of fixed assets added that were productive fixed assets compared with state investment by sector shows conclusively that some nonproductive investment in the form of housing and communal services is included under sector allocations of state investment in the productive sectors. The details of adjusting the figures, however, will not be presented here.

The estimates of gross national product in current prices shown in table 1 are based on the previous estimates made by the author³ with some key revisions and extensions for 1958-59 were made on the same procedures. The most important revisions resulted from the new estimates both for fixed investment and for inventories that resulted from research on capital formation as discussed above. Other revisions made are: (1) the series for farm home consumption was revised

¹ Liu and Yeh, *op. cit.*

² State Statistical Bureau, "*Ten Great Years*," (Peking, Foreign Languages Press, 1960).

³ William W. Hollister, "*China's Gross National Product and Social Accounts, 1950-57*," (Glencoe, Ill.: The Free Press, 1958).

in view of new estimates for inventory changes by farm households and in view of later data on the flow of producer goods to the agricultural sector; (2) urban rental income and expenditures are revised using the data on housing and a figure for house rent in 1957 converted to current prices with the cost-of-living index used in the previous estimates; and (3) the estimates for consumer services in urban areas is revised on the assumption that employment in this sector remained constant in relation to the urban population—an assumption considered much more satisfactory than the previous assumption used that such services were a constant proportion of urban retail sales. The resulting estimates have led to much more satisfactory statistical discrepancies in the accounts and when checked against the other estimates made give cause for believing that they are close to the best estimates that could be made.

The analysis has also used estimates for GNP and for various sectors in 1952 constant prices. The estimates for income originating in agriculture are essential parts of the overall estimates of GNP and conversion to constant prices involves the same indexes for farm procurement prices used previously. Estimates for indirect taxes include only commodity taxes—a narrower definition than many have used who believe that many direct taxes are essentially indirect taxes. For our purposes the estimates presented previously are sufficient. For the analysis in the body of this paper, direct estimates for income originating exclusive of commodity taxes were needed for the capital goods sectors in 1952, together with indexes that would give us estimates in 1953, 1956, and 1957. For income originating in construction the estimates by Liu and Yeh were used. For modern transportation the estimates derived by Liu and Yeh based on ton-kilometers of freight and passenger-kilometers were used both for income originating in 1952 and for an index for the other years. Liu and Yeh do not themselves accept their index, but their index is completely consistent with their own data on output of heavy industry and the sectors that furnish modern transportation with the commodities to be moved, and their own index is inconsistent with data they accept on production in heavy industry. For heavy industry itself a direct estimate was made of income originating in 1952 and an index of heavy industry output was derived from the indexes presented by Kang Chao.⁴ Income originating for light industry was derived in the same way as for heavy industry.

⁴ Kang Chao, *"The Rate and Pattern of Industrial Growth in Communist China,"* (Ann Arbor Mich.: The University of Michigan Press, 1965).

**COMMUNIST CHINA'S DEFENSE ESTABLISHMENT:
SOME ECONOMIC IMPLICATIONS**

BY

J. G. GODAIRE

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COMMUNIST CHINA'S DEFENSE ESTABLISHMENT: SOME ECONOMIC IMPLICATIONS¹

INTRODUCTION

The purpose of this chapter is to review developments in the defense establishment of the People's Republic of China (PRC) over the past 5 to 10 years from an economic point of view. The author has no intention of predicting either explicitly or implicitly the outcome of the present political ferment.² Rather it is the intention of the author to cover two facets of the Chinese Communist defense establishment: first, its budget, and, second, the economic impact of its operations and its development and modernization in the Chinese Communist cultural context and in an economy which is partly primitive and partly modern.

THE DEFENSE BUDGET

In a similar survey³ related to Soviet economic power, this author reviewed the available open sources of information relating to the claim of the military establishment on the Soviet economy. In that instance, it was concluded that such claim is ascertainable only within quite wide limits. When one attempts to survey the same sort of information with respect to Communist China it is immediately apparent that one is faced with information difficulties greater by at least one order of magnitude, if only by reason of the fact that the government has not publicly announced a budget since April 1, 1960, when it announced its plans for 1960, as table 1 indicates.

TABLE 1.—*Communist China: State budget expenditures,¹ 1950-66*
[Billion current yuan]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960 plan	1961- 66
Economic construction . . .	1.7	3.5	7.6	8.6	12.4	13.8	15.9	14.9	26.3	32.2	42.9	(?)
Social cultural education . . .	.8	1.3	2.3	3.4	3.5	3.2	4.6	4.6	4.4	5.9	8.6	(?)
Defense	2.8	5.1	4.4	5.7	5.8	6.5	6.1	5.5	5.0	5.8	5.8	(?)
Administration	1.3	1.8	1.7	2.1	2.2	2.2	2.7	2.3	2.3	2.9	3.2	(?)
Other ² . . . . .	.2	.2	.8	1.7	.8	1.3	1.3	1.7	1.4	1.6	3.7	(?)
Total ⁴	6.8	11.9	16.8	21.5	24.6	26.9	30.6	29.0	39.3	48.3	64.2	(?)

¹ Additional appropriations for bank loans are not included.

² Not available.

³ Includes appropriations for repayment of national debts, foreign aid and other miscellaneous expenditures. The 1960 plan figure also includes an appropriation for the general reserve.

⁴ Due to rounding, components may not add to the totals shown.

Sources: *Ten Great Years: Statistics of the Economic and Cultural Achievements of the People's Republic of China*, the annual reports of final state accounts, delivered to the National People's Congress by the Minister of Finance, and the draft state budget for 1960.

¹ The author of this chapter is indebted to the research assistance performed by Miss Nancy Read and Mr. William Shade.

² This chapter was written in October 1966. (Should such a suggestion of a prediction arise through inadvertence, the author hereby disclaims responsibility.)

³ J. G. Godaire, "The Claim of the Soviet Military Establishment" *Dimensions of Soviet Economic Power*, Washington, 1962.

There are several other sources of discomfort with the budget as well. China has a long history of taxation in kind of agricultural output. Beginning in 1950, agricultural taxes have been monetized and entered into the budget. Whether or not some produce may be withheld outside the budget and devoted to military purposes is presumably doubtful but cannot be entirely discounted.⁴ The military establishment has a tradition of partial self-support; at one time it seems to have been required to provide one-quarter of its own food requirements. Also, the military establishment has a tradition of performing useful service such as clearing canals and harvesting crops. Compensation for such services may or may not be made. If made, this compensation may or may not be reflected in the budget. If reflected in the budget, it may be accounted for as revenue⁵ or it may be netted from expenditures.

Further, in 1956 there seem to have been significant internal alterations in the major classifications of budgetary expenditures without publication of matching adjustments of the data for prior years. Similarly, it seems probable that at least during a portion of the period the overall coverage of the budget increased as the process of socialization proceeded. In terms of the subject at hand, such a phenomenon would more likely affect the share of defense than its level.

The expenditures budget of the PRC may readily be characterized as "Soviet-type," at least in general terms.⁶ The state budget is a consolidation of all budgets, central and local. The section on economic construction is ostensibly the fount of new investment funds, including those for defense industry. At least one exception is indicated—those expenditures originally listed under this classification for the special training of cadres and those earmarked for primary schools, middle schools, hospitals, cultural and literary units, publishing houses, and experimental and research organs are listed under the appropriate items under the expenditures for cultural education.⁷ There are also investment funds under other budget sections as well.

The scope of the expenditures carried in the section of the budget for national defense is not without ambiguity. One Chinese Communist authority indicates that there are "expenditures which will guarantee national independence and security and safeguard world peace. These include *maintenance* expenses of the army, the navy, the air force, and the militia as well as expenditures for defense construction."⁸ [Emphasis supplied.] In a different place in the same work⁹ the same authority states that these expenditures "comprise *all outlays* for the Chinese army, navy, air force, and *various* defense construction projects." [Again, emphasis supplied.] A different source which will be discussed below suggests that the militia are not in the national defense section. What "defense construction" or

⁴ For an extensive treatment of Communist China's taxation system and the revenue side of its budget, attention is directed to George N. Ecklund, *Financing the Chinese Government Budget: Mainland China, 1950-59*, Chicago, 1966; and Ko Chih-ta, *Kuo-tu Shih-ch'i Ti Chung-Kuo Yu-suan* (China's Budget during the Transition Period), Peiping, April 1957, ch. III.

⁵ No specific account for this purpose has been noted.

⁶ Differences which are of no consequence to the development of the theme of this chapter, whether major differences or merely subtle nuances, will not be discussed.

⁷ 1956—*nien Chung-yang Ts'ai-cheng Fa-kuai Hui-pien* (Compendium of Central Government Financial Decrees and Regulations, 1956), Peiping, November 1957. P. 43. (Hereafter this source will be referred to as 1956 Compendium.)

⁸ Ko Chih-ta, *op. cit.*, p. 46.

⁹ *Ibid.*, p. 129.

“various defense construction projects” include has not been clarified. The Chinese ideographs which are rendered here as “maintenance” and as “outlays” are less than helpful in determining whether the national defense section of the budget covers the procurement of major military equipment or not.

Whether or not military procurement is considered an investment is not indicated, although one’s curiosity is whetted further by the absence of specific budget account numbers for use under certain economic construction accounts. The omissions occur in connection with such items as—

- (a) expenses for the (then) first machine industry for the installation of equipment in “various main organs,”
- (b) expenditures for transportation for sea and river operations for maintenance of navigation routes excluding those under harbor districts,
- (c) expenses for the care of docks,
- (d) expenses for local transportation operations, and
- (e) funds for material reserve for the state.

There is even a possibility that major military equipment may be considered and budgeted for as capital construction under the economic construction fund. The logic of this possibility is impeccable and documentable. Investment in capital construction is one of the two most important categories among the appropriations for economic construction. Capital construction means the (gross) increase in the stock of any fixed assets, productive or nonproductive. Fixed assets are items of great value (worth more than 200 yuan) which can be used for a long time (presumably more than 1 year).¹⁰ “The scope and rate of investment in capital construction * * * reflect the status of the expansion of reproduction, reflect the rate of progress of the nation’s socialist industrialization and her economic strength, *reflect the growth of national defense*, and also reflect the course of increase in the material and cultural living standard of the people.”¹¹ The reader will note that the words to which emphasis has been supplied represent a quite straightforward statement of a direct relationship between national defense and capital construction in contrast to the more derivative relationship of the “course” of increase in the living standard. In short, capital construction may be military equipment as well as the means for its production.

The sources for financing military research and development (R. & D.) are also not clear. On the basis of the practice in the U.S.S.R., expenditures for science in the social and cultural section would be expected to cover the bulk of the national effort. Whether conceptually this would cover all R. & D. efforts as they would be defined in the West is difficult to determine with confidence. In the PRC it is clear that all research and experimentation in central government-controlled scientific research institutions (which would include all military research institutions) and institutions of higher education is supposed to be conducted with funds from the social and cultural section of the budget.¹² This requirement probably accounts for a significant portion of the nearly tenfold increase in expenditures

¹⁰ *Ibid.*, p. 105.

¹¹ *Ibid.*, p. 106.

¹² *Ibid.*, p. 46.

covered by this section in 1960 as compared with 1950. However, it would seem that considerable R. & D. may be financed with funds for economic construction.¹³ The trial manufacture of new products,¹⁴ which may or many not refer to activities regarded in the West as the development of prototypes, apparently is considered an investment, as is investment in research on organic products and on model plants for medicine making.¹⁵ The accounting regulations for the account "national defense expenditures" add nothing to the solution of the problem. The full explanation of the details in the various budgetary accounts is one of the five principles on which budgetary accounts are supposedly formulated. Yet, no further explanation for the defense account is given other than that it is an item for the sole use of the central government.¹⁶

That the scope of the "defense" category is not as broad as that used in the U.S. budget, however, is explicit. Among the categories lumped together under "other" expenditures in table 1 are expenditures which are of some considerable relevance to defense in its Western sense. According to one rendition, this "other" category would seem to include expenditures for the militia (in the sense of the Reserve or National Guard), for food expenses of local conscription bureaus, and for air defense projects.¹⁷ According to another rendition, this "other" category includes, in addition, expenditures for repairing local military service clubs and for "supporting the battle front".¹⁸ Also members of the armed forces with chronic diseases are cared for in hospitals financed with social and cultural funds. These funds also provide "living expenses for aged cadres,"¹⁹ and thus "national defense" expenditures seemingly do not include any retired pay.

Thus one is reduced to about the same quandary as one is with the defense budget of the U.S.S.R. as to what the explicit budget means, as to whether expenditures are gross or net, and as to whether or not the meaning has shifted once or more in the course of time. In effect, one may question whether the "national defense" expenditure series as published has any usefulness for the interpretation of the military policy and posture of Communist China.

THE ECONOMIC IMPACT OF DEFENSE

In approaching the question of the impingement of the military policies and posture of Communist China on its economy over the past 5 to 10 years, it seems wisest to subdivide the question into two aspects from the outset. Highly oversimplified, the reason for this subdivision is that there are two economies: one, the larger, primitive and agricultural; the other, comparatively modest in size, modern²⁰ and industrial. Broadly speaking, the dichotomy in these economies is paralleled by a dichotomy in the economic impingement on the peacetime utilization of resources by the military establishment: operating costs (military personnel and operation and maintenance) on the one

¹³ See Ko Chih-ta, p. 105, where it is indicated that capital construction expenditures include scientific research and experimentation connected with the engineering work for capital construction.

¹⁴ 1956 *Compendium*, p. 52.

¹⁵ *Ibid.*, p. 57.

¹⁶ *Ibid.*, p. 64.

¹⁷ *Ibid.*, p. 44.

¹⁸ *Ibid.*, p. 67.

¹⁹ *Ibid.*, p. 63.

²⁰ In the sense that the technology employed dates from (say) 1850 or later.

hand; and modernization costs (research, development, test and evaluation—R.D.T. & E.—and procurement of new equipment) on the other.²¹

DEFENSE OPERATING COSTS

The operating costs of the PRC defense establishment are its house-keeping costs: the pay, food, and clothing for military personnel; the pay for civilian employees; the operation and repair of barracks, depots, and warehouses; and the consumption of ammunition, motor fuels, some spare parts, and other miscellaneous materials in training and other similar activities. In Communist China these costs relate primarily to the primitive economy, which is typified as agricultural but limited in the availability of arable land, populous to the point of overpopulation, rudimentary in available technology and capital equipment, simple in its living standard, and rugged in its provision of creature comfort.

For reasons which are not unrelated, the bulk of the defense establishment is semimodern at best (which is not to be interpreted as implying that it is ineffective). Except for a largely obsolescent air force, a small navy and a number of armored and artillery units, the bulk of the forces (perhaps 85 percent in terms of military manpower) either is organized into or supports infantrymen supplied only with the essentials for field operations. This army is the lineal descendant of the Chinese Red Army of the long marches and the Sino-Japanese war which become the People's Liberation Army (PLA) of the Chinese civil war and the present. Its training and traditions emphasize long distance route marches. Its world tends to be one of rifles, grenades, mines, and mortars. Marksmanship—training ammunition—seems to be sacrificed, a deficiency presumably relieved by an advantage in manpower.²²

The PRC unquestionably has a large standing military force. In terms of active military manpower, it has probably fluctuated at 2½ to 3 million men for the last decade. During the period 1950-56, it may have ranged up to twice that size or even more.²³ It is, however, the thesis of this section of this chapter that, *insofar as operating or housekeeping costs are concerned*, to date the economic impact of this force has been small at most. Or put another way, in this respect the net cost of this force has been roughly equivalent to zero.²⁴

This author makes no pretense that he can prove this thesis with statistical data. The argument for the thesis has two sides. On one side, the product of, say, 2 million additional men in the civilian labor force would represent a very small increment to national income. This number represents something like one-half of 1 percent of the labor force of the country. More important, because this sort of

²¹ These terms are used here in the same sense in which they are used in the Department of Defense section of Budget of the U.S. Government. Military construction is deliberately not mentioned. It may, however, be similarly dichotomized between the primitive and the modern in Communist China and will be covered implicitly in the analysis which follows. Nuclear energy and space activities, for the purpose of this analysis, are considered to be research and development activities.

²² See Edgar O'Ballance, "The Red Army of China," New York, 1963, ch. 11; and Robert B. Rigg, "Red China's Fighting Hordes," Harrisburg, Pa., 1952, ch. 4; for a good coverage of the subject.

²³ In "Ko Chih-ta," p. 133, there is a statement which may be interpreted to suggest a peak of 7½ million men "several years" before 1956.

²⁴ This is to say that the value of the net product attributable to the resources in the best alternative employment to which they could be devoted would not differ significantly from the value of the services rendered in military service.

group, on the average, would not be particularly rich in critical skills, their productivity (output per man) would be very low also. Chances are good that such an addition to the labor force would add much more to the underemployment of the peasantry than to the national product.

On the other side, as has been noted earlier, the average active man in uniform is far from nonproductive while on active service. The "self-production and supply" tradition is maintained; at one time regulations required that the establishment be 25 percent self-sufficient in food.²⁵ It is also usual practice for more than half of the defense establishment to be turned out to assist in the countryside at planting and harvesting time. Work on roads, railroads, canals, drainage ditches, and construction projects receives similar attention by the military. Reportedly, Marshal Lin Piao's predecessor as Minister of Defense, Marshal P'eng Teh-huai, objected to these productive activities on the grounds of their interference with military training.²⁶

Further, at least from time to time, the PLA or a selection of its officers or units have been called upon to perform substantial roles in the political and economic administration of the country. The reasons for this are many. At the end of the civil war the army occupied many provinces; it was competent to administer, it was experienced in doing so, it was "there" and transportation and communications were frequently slow or nonexistent. Many of these reasons continue to obtain to one degree or another.

Finally the PLA has or at least has had substantial internal police and border guard responsibilities. Its mission was stated in 1956 as comprising four elements: "to safeguard the Socialist construction of its fatherland, to safeguard China's sovereignty, territorial integrity and security, to be ready to liberate Taiwan at any moment, and to maintain China's internal peace and order."²⁷ Only one element of the four, the "liberation" of Taiwan, has a completely military ring to it. In 1959 the last responsibility (maintaining internal peace and order) was extensively exercised, various units from battalion to division in size had to be imposed on some communes to keep order.

In sum, this author is inclined to believe that except for those forces "ready to liberate Taiwan at any moment" and the border guards, the PLA consists of rather inexpensive troops which the central government undoubtedly feels are at least as, if not more productive than they would be in alternative employment. The Taiwan liberation forces, which presumably embrace the more modern forces, and the border guards probably do not show up as well on the economic output side but *in terms of housekeeping costs* do contribute substantially on the average to their keep or to the harvest and the like.

DEFENSE MODERNIZATION COSTS

The PRC has pursued rather strenuously a policy of military modernization beginning at least as long ago as 1952. Initially, the fulfillment of this policy was based on two sources—military equipment imported from the Soviet Union, and an indigenous production base.

²⁵ Rigg, *op. cit.*, p. 118.

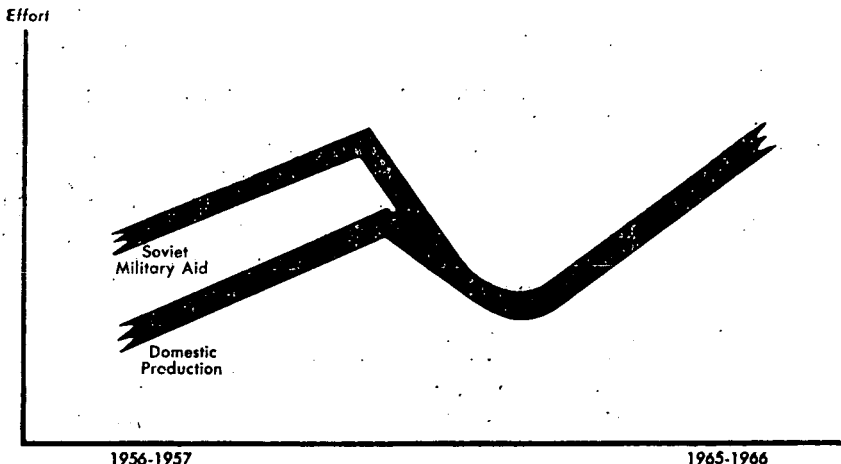
²⁶ His disagreement with this policy along with many other policies related to political control, doctrine, and strategy led in September 1959 to his removal from office and also to the removal of Gen. Huang K'o-ch'eng, Chief of the General Staff.

²⁷ Ko Chih-ta, *op. cit.*, p. 131.

The priority to be accorded the latter was indicated in August 1952 by Gen. Hsiao Hua²⁸ when he wrote that while "the long-range objective of our economic construction is, of course, the realization of national industrialization * * * our present economic construction * * * cannot but be directed to the needs of national defense."²⁹

Figure 1 illustrates the progress of the modernization program schematically. As the figure shows, the importation of military equipment from the Soviet Union was well established by the mid-1950's. It also indicates that the progress of the indigenous production base was quite rapid up to 1960. This rapid development was due in large part to Soviet technical aid that gave the Chinese the capability to produce copies of Soviet equipment. Initially, this indigenous production relied heavily on Soviet-built components, such as engines and radios for Chinese-produced Mig-17's. Nevertheless, when the domestic production program peaked just prior to 1960, the extent of this reliance had diminished considerably and the Chinese were producing copies of Soviet pistols, submachineguns, tanks, submarines, naval vessels, and aircraft in quantity.³⁰ Also, the recent nuclear demonstrations and the firing of a nuclear-armed missile suggest (when one considers the leadtimes and probable size of facilities involved) that a substantial research and development effort in support of advanced weapons systems was initiated prior to 1960.

Military Modernization in Communist China



²⁸ Then the Deputy Chief of the Political Department of the People's Revolutionary Military Council.

²⁹ For further details and an interpretive analysis of the early modernization program see "Modernized Army Tops Peiping Plans," *the New York Times*, Aug. 9, 1952, 2: 4.

³⁰ Details of Chinese Communist weapons production may be found in such sources as *Jane's All the World's Aircraft*; *Jane's Fighting Ships*; W. H. B. Smith and Joseph Smith, *Small Arms of the World*, Harrisburg, 1966, and Institute for Strategic Studies, *The Communist Bloc and the Western Alliances: The Military Balance, 1960*, London, 1959.

The withdrawal of Soviet assistance in the latter half of 1960 began to confront the Maoist leadership with a dilemma. The costs of military modernization (whether it be the R.D.T. & E. aspect or the production/procurement aspect) impinge primarily on what the Chinese Communists term their "metal processing industry."³¹ To the extent that this program involves research, new designs, experimentation, new technology, or substantial rearrangement of production processes, it impinges on the available supply of scientists, engineers, skilled technicians and craftsmen, and critical material. The more the program has as its objective the attainment of a capability in advanced weapon systems, the greater the impingement on the higher quality end of the spectrum of these resources.

As the failure of the Leap Forward program deepened, the dilemma sharpened. The production of investment goods, upon which economic growth depends, also requires research and development and metal processing resources. In Communist China, where there is no excess capacity in these areas, military modernization competes directly with economic growth. Resources devoted to military equipment production represent economic growth foregone; resources devoted to investment goods represent military modernization foregone.³² The economic failure clearly called for choices to be made between major economic end uses.

The precise issues of the policy debate that might have taken place at the time are obscure. It is clear, however, that the leadership did not resort to what one might consider the rational solution of the textbooks. This is to say Communist China did not proceed to concentrate on the production of investment goods and on "civilian" economic growth, simultaneously paring down military programs to those ongoing projects which would cost more to halt than to continue. Had this option been selected, the total output of the metal processing industry in Communist China would be greater today than it is, but military modernization would be considerably less advanced. It is possible also that there would have been no capability to produce the nuclear demonstrations of the recent past.

It would seem equally clear that the leadership did not take what might be considered the Stalinist approach—that is, agricultural exports were not increased to purchase investment goods in the free world in lieu of Soviet aid.³³ A decision of this sort would undoubtedly have resulted in some starvation and in some slowing down of the population growth. The decision of the Government to import grain to compensate for recent crop failures suggest strongly, however, that if such solution were considered at all it would have been set aside.

It is clear that while the military modernization program may have been delayed somewhat by the exigencies of the situation it continued to claim a substantial share of the output of the metal processing in-

³¹ In the U.S.S.R. this sector is referred to as the machine building and metal working sector; it embraces the production of machinery and equipment (producer or consumer) and the production of metal products such as pipe and wire.

³² Resources of this kind devoted to consumption are also in competition, but are presumably negligible. Some specialized resources may not be transferable from producing military or civilian goods to investment goods. However, this condition is not expected to loom as a large impediment to transferability in Communist China, nor to persist to any significant degree beyond the short term.

³³ For a discussion of Chinese activities in this respect, see Central Intelligence Agency, *Communist China's Balance of Payments, 1950-65*, Washington, 1966, p. 8 ff.

dustry. In fact, it seems most likely that plans for the production capacity for military equipment actually may have been adjusted upward to substitute for lost Soviet military assistance.

It is virtually impossible to measure the relevant series with sufficient confidence to decide on statistical grounds whether or not the military portion of metal processing output increased, decreased, or remained constant during the 1960's. It seems, however, that under the circumstances the failure of the regime to follow what was dubbed the "text-book solution" above, was tantamount to a decision that the military share would certainly not fall and would probably rise.

This result follows if only because of the civilian investment goods and productivity gains forgone. The corollary of this proposition is that the rate of increase in the output of military equipment has more than likely outpaced that of civilian equipment significantly over the period since the failure of the Leap Forward program. As figure 1 illustrates, it is the judgment of the author that the military modernization effort (research and development plus new equipment) based on domestic production must have risen rather dramatically since the 1960-62 trough. At the current time it may (in rough terms) match the 1957-59 peak domestic effort *plus* Soviet military aid. This domestic production of military equipment seems to have had priority over the production of "civilian" investment goods at considerable cost to the overall Chinese economic growth rate.

Part II. THE ECONOMIC SECTORS

**THE MINERAL RESOURCE BASE
OF COMMUNIST CHINA**

BY

K. P. WANG

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THE MINERAL RESOURCE BASE OF COMMUNIST CHINA

INTRODUCTION

A country must have access to resources and industrial-commercial capability to become influential in world economics. Communist China has most of the necessary resources and is building its technical know-how. Human resources are without parallel, but the expanding population is exerting great pressure on the land and the limited food supply. Chinese agricultural resources can be developed to more than meet basic needs, but only through tremendous capital investments necessary for providing fertilizers and equipment. Currently, however, Chinese agriculture can hardly raise the capital for its own advancement and thus has no funds available for diversion to industrial development.

In mineral wealth, China is relatively richly endowed and is already a significant world producer of mineral products. Yet China has its geographical and geological idiosyncracies so that surpluses and deficiencies exist, both in mineral potential and mineral production.

Given favorable development conditions, the country can become an industrial giant. The process may be slow, particularly in terms of diversification of products, production of materials for consumer goods, and meeting the needs of agricultural development, because of traditional problems of China and the nature of a centralized economy. Most likely, the country will only be able to attain second-rank status as a world economic power in the decade ahead.

Conceivably, technical manpower would be on the upsurge, industrial experience would gradually improve, international contacts would be sought, transport development would make slow headway, bureaucratic waste would be perpetuated, and industrial capital would be difficult to accumulate under the state enterprise system. These and other factors will be examined in evaluating China's mineral resource base.

Before looking into the future, however, it would be well to review the recent past and assess the present. Accordingly, the following table 1 is presented to give a quick evaluation of the magnitude and diversity of Chinese minerals. This is followed by a review of the Chinese mineral situation for 1965, as prepared by the author for the "1965 Minerals Yearbook, Volume IV, Area Reports: International."

CURRENT STATUS OF THE MINERAL INDUSTRY ¹

[Replacing original heading in the Minerals Yearbook which was "The Mineral Industry of Mainland China"]

Mainland China continued to be an important mineral producer by world standards, although not in terms of per capita output. Its

¹ From here until the beginning of the section "Basic Factors Affecting Development," text is quoted verbatim from *Bureau of Mines 1965 Minerals Yearbook*, vol. IV preprint chapter on Mainland China, also written by the author.

TABLE 1.—*World significance of selected Chinese minerals in 1965*¹

Commodity	Approximate rank in world output	Share of estimated world output (percent)	Adequacy in production	Reserves or resources.
Metals:				
Aluminum.....	9	2.0	Virtually adequate.....	Considerable.
Antimony.....	1	24.0	Large surplus.....	World's largest.
Bismuth.....	5	7.0	do.....	1st rank.
Chromite.....	(²)	(³)	Greatly deficient.....	Unimportant.
Copper.....	10	2.0	Deficient.....	Moderate.
Gold.....	(⁴)	(⁵)	Can use more.....	Do.
Iron ore.....	4	6.0	Adequate.....	1st rank.
Iron, pig.....	5	6.0	do.....	Not applicable.
Iron, steel ingot.....	7	3.0	do.....	Do.
Lead.....	9	4.0	Slight surplus.....	Moderate.
Manganese ore.....	6	6.0	Surplus.....	Considerable.
Mercury.....	4	9.0	Large surplus.....	1st rank.
Molybdenum.....	5	3.0	Sizable surplus.....	Do.
Nickel.....	(²)	(³)	Greatly deficient.....	Unimportant.
Tin.....	2	13.0	Large surplus.....	1st rank.
Tungsten concentrate.....	1	30.0	do.....	World's largest.
Zinc.....	11	3.0	Slight surplus.....	Moderate.
Nonmetals:				
Asbestos.....	5	4.0	Moderate surplus.....	Considerable.
Barite.....	8	3.0	Slight surplus.....	Do.
Cement.....	8	3.0	do.....	Extensive raw materials.
Fluorspar.....	5	8.0	Sizable surplus.....	Considerable.
Graphite.....	5	7.0	Adequate.....	Moderate.
Gypsum.....	13	1.0	do.....	Considerable.
Magnesite.....	3	11.0	Surplus.....	1st rank.
Phosphate rock.....	7	1.0	Seriously deficient.....	Considerable.
Pyrite.....	5	6.0	Can use more.....	Do.
Salt.....	2	13.0	Slight surplus.....	1st rank.
Sulfur.....	8	2.0	Surplus.....	Moderate.
Talc.....	5	4.0	do.....	Do.
Mineral fuels:				
Anthracite.....	2	12.0	Adequate.....	1st rank.
Bituminous coal.....	3	15.0	do.....	Do.
Coke.....	5	5.0	do.....	Do.
Petroleum, crude.....	17	.6	Nearly self-sufficient.....	Moderate.
Petroleum, refined.....	(⁴)	.5	Deficient.....	Not applicable.

¹ Chinese production estimated by author generally as an order of magnitude rather than as a definitive quantity. Consequently, the determinations of world rank and of share of world output can be greatly regarded only as approximations. Moreover these determinations may also be inexact because of incomplete or erroneous reporting of the output of other countries.

² Insignificant.

³ Very small.

⁴ Not among the 1st 20.

⁵ Small.

estimated 1965 mineral output value (mine output plus added value derived from smelting and processing) of approximately \$4 billion ranked the country just within the first 10 top mineral producing nations of the world. Although far behind that of Japan, the Mainland China mineral output value exceeded that of the rest of the Far East countries put together. The mining component of the Chinese mineral industry remained much stronger than the metallurgical component. As in previous years, basic industries like coal, steel, cement, oil, and salt constituted the backbone of mineral enterprises. Many well-known export minerals and metals were also produced.

The country was one of the three foremost world producers of bituminous coal, anthracite coal, tin, tungsten, antimony, salt, and magnesite. It also ranked about fifth or better in the output of bismuth, manganese, mercury, molybdenite, asbestos, fluorspar, pyrite, talc, and graphite; about seventh in iron and steel; and about 10th in the major nonferrous metals, cement, barite, phosphate rock, and sulfur. Notable production deficiencies continued in chromite, nickel, copper, and phosphate rock. Mainland China imported sizable tonnages

of special-finished steels and chemical fertilizers from Japan and Western Europe.

The most significant mineral developments again concerned petroleum. In 1965 the country had clearly become "mainly self-sufficient" in oil, with the Tach'ing field primarily responsible. A large refinery has also been built at the Tach'ing field. This, however, was not adequate for handling local crude; and the surplus was shipped to other areas in a special pipeline. Chinese offers to sell Tach'ing crude to Japan apparently were serious, although conceived as a temporary measure. Importance of Tach'ing is such that it probably furnished about one-third of Mainland China's crude and one-fourth of the refined petroleum. Large increases in refinery production were reported for the Karamai refinery in Sinkiang; this is rather significant in the light of completion of the western railroad connecting Tihua (Urumchi) the provincial capital with the north China coast. Additional, and more diversified, refining equipment was also installed at Lanchow in Kansu. Shanghai and other industrial centers manufactured many types of oil drilling and refining equipment.

On May 14, Mainland China exploded its second atomic bomb somewhere in the west, almost certainly in Sinkiang Province. It was more sophisticated than the first, and again uranium 235 apparently was used instead of plutonium. Although Lanchow was believed to have gaseous diffusion capability, most of the U²³⁵ may have been made in Czechoslovakia from Chinese ores.

In iron and steel, the effort was to increase production through application of new techniques in existing facilities; further diversify the variety of products made; continue construction of partially completed steel centers; employ more coal blending to conserve coking coal for blast furnace operations; introduce oxygen converters to complement the open hearths; relieve the shortage of special rolled products through production and imports; negotiate purchase of some foreign steel equipment and plants; and plan for expanded operations in the future. A million-ton increase in steel output over that of 1964 may have been achieved. At yearend, a big steel deal was being concluded to have an international consortium headed by West German firms (DEMAG Aktiengesellschaft and others) build a large integrated steel plant valued at possibly \$150 million and presumably equipped with pelletizing plant, oxygen converters, hot and cold rolling mills, and tube and railing facilities.

The coal industry continued to make progress along conventional lines of development. The shaft sinking program was accelerated for both old and new mines. Mining productivity was raised through greater mechanization, but the best output per man-day was still below 2.5 metric tons of coal. Improvements were specifically mentioned for the Fushun, Fuhsin, Tatung, Huainan, Pingtingsham, Chinghsi, and Yangchuan mines, among others. Much stress was placed on blending weakly caking coals with good coals for iron smelting. Despite slightly higher production, increased coal demand called for economies in coal consumption.

Continued great emphasis was given to fertilizers. A substantial increase in output was claimed, so that the 1965 figure was at least 5 million tons of chemical fertilizers; imports from Japan and Western

Europe were also much higher than in the previous year. Local phosphate rock was still inadequate, in view of the 553,165 metric tons exported by Morocco to Mainland China during the first 9 months of 1965. Cement output increased by perhaps 5 percent, with at least one large new plant placed in operation. At the foremost asbestos center—Shihmien in Szechuan, an expansion program was nearly completed and new ore reserves were found. A long-term contract was signed with the Japanese to supply them with large tonnages of fluorspar. Salt had an excellent year, recording the highest output in the last 5 years.

GOVERNMENT POLICIES AND PROGRAMS

By yearend, Mainland China was making preparations to start on its Third Five-Year Plan covering 1966-70. This would mean a 3-year lapse since the end of the Second Five-Year Plan. No announcement was made regarding the national targets for the coming years. However, specific industries were urged to clear their decks and raise their sights for expanded production. Policies and programs pursued in recent years in terms of consolidation and maximum utilization of available facilities, have brought about notable improvements in industrial growth and overall economy. In fact, the Chinese claim that industrial output rose by 15 percent in 1964 and that the target of another 11 percent in 1965 was overfulfilled.

Mainland Chinese economic planning still stressed agriculture, light industry, and heavy industry, in that order. However, heavy industry was gaining ground and more basic construction was underway. The Chinese realized that new facilities had to be created in order to make significant further advances in industrialization. In 1965, there was evidence that industries such as machinery and equipment, machine tools, power and electronics, nonferrous metals, and building materials were being built up in anticipation of greater effort in basic construction.

Minerals and certain heavy industries, such as coal mining, petroleum extraction, iron and steel, cement, and chemicals, have long been recognized as being indispensable to the country's economic development. Accordingly, continued stress was placed on optimum performance from facilities at hand. Production targets were raised only slightly. Rather, the policy was to improve product quality, diversify products, streamline operations, and conserve materials. Improvements were made at many mines and plants, and the more promising of the smaller mines and plants were slated for expansion. Construction of new projects was at a greater pace than last year. Special attention was given to the development of metal fabrication facilities.

Much effort went into assisting agriculture. Production of chemical fertilizers and their raw materials was greatly expanded; imports of fertilizers were doubled; and foreign help in building fertilizer plants was sought. Even steel production was partly geared to agricultural requirements, resulting in the manufacture of more agricultural tools and machinery. More pesticides were made in petroleum refining and chemical processing.

Mainland China pursued an independent policy in mineral trade, doing less business with the U.S.S.R. than previously and trading more with other Communist countries as well as non-Communist countries. In carrying out a program of developing a strong self-reliant industrial system, many mineral and industrial facilities of Chinese design and construction were placed in operation. Withdrawal of Soviet technical aid dictated this policy. To keep up with world developments, a special effort was also made in 1965 to procure additional advanced technical know-how through purchase of foreign plants and materials and permitting foreign technicians and advisers to come in.

The Chinese Communists continued to stress "specialization and cooperation in developing mass production." Numerous national technical conferences were held on specific subjects. The larger and more established industrial units helped the smaller and newer ones. Some factories and cities exchanged workers for the purposes of pushing adult education and improving industrial skills. There was close cooperation between universities and institutes and mines and industries. Such were some of the steps taken in preparation for an "industrial upsurge."

PRODUCTION

Mineral output value rose by possibly 5 percent over that of 1964. The 1965 level was more than in any of the preceding 5 years, except for the exaggerated figures claimed for 1960. The mineral industry, with a strong mining base and an improving metallurgical sector, operated substantially in a conventional manner, having done away with most of the haphazard operations.

Coal and iron and steel each accounted for more than one-third of the mineral output value; petroleum, nonferrous metals, and cement together made up for about one-fourth. Output of many individual metals and nonmetals represented significant shares of world totals.

The Chinese Communists have not reported any mineral output statistics for 5 years, having been traditionally secretive about their colored metals. Nevertheless, general trends are clear. Fertilizer, salt, and petroleum production made the most notable gains in 1964, followed by steel, cement, and coal. Nonferrous base metals remained somewhat stationary, whereas output of a few of the famous "export" metals may well have dropped.

It was claimed that the Ministries of Metallurgy, Coal, Power, Petroleum and Chemical Industry met their 1965 targets in November, and that iron and steel, nonferrous metals, coal, petroleum, chemicals, fertilizers, cement, salt, and many others "achieved remarkable increases in output."

TRADE

Overall trade volume of Mainland China, never much of a trading country, showed a one-sixth increase in 1965 to possibly \$3.8 billion. Minerals and metals remained significant in total trade, although occupying lesser positions than in 1963-1964. Apparently, oil imports declined, imports of metal products increased, imports of chemi-

cal fertilizers rose sharply, exports of traditional surplus minerals and metals dropped somewhat, exports of cement may have declined slightly, and exports of asbestos and salt increased. There were no published trade figures from Mainland China, and data from countries trading with China were used. Accordingly, official trade statistics from the U.S.S.R., Japan, and Poland have been presented to show trends. Political differences and completion of debt payment by Mainland China brought about reduced Sino-Soviet mineral trade. Conversely, trade with Western Europe, and Japan rose by more than 50 percent and trade with Eastern Europe also was higher. On April 29, a new Sino-Soviet trade agreement was signed that might lead to an improved trade relationship.

Increased trade with the British was brought about mainly through Chinese purchases of \$120 million worth of gold, \$6 million worth

TABLE 2.—Mainland China: Production of metals and minerals ¹

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite ².....metric tons.....	400,000	400,000	400,000	400,000	400,000
Alumina.....do.....	200,000	200,000	200,000	200,000	200,000
Metal, refined.....do.....	100,000	100,000	100,000	100,000	100,000
Antimony, mine.....do.....	15,000	15,000	15,000	15,000	15,000
Bismuth, mine.....do.....	300	300	300	300	300
Copper:					
Mine.....do.....	80,000	90,000	90,000	90,000	90,000
Metal, refined.....do.....	100,000	100,000	100,000	100,000	100,000
Gold.....troy ounces.....	60,000	60,000	60,000	60,000	60,000
Iron and steel:					
Iron ore ³.....thousand tons.....	35,000	30,000	35,000	37,000	39,000
Pig iron.....do.....	15,000	15,000	17,000	18,000	19,000
Steel ingot.....do.....	9,500	10,000	12,000	14,000	15,000
Rolled steel.....do.....	8,000	9,000	10,000	11,000	12,000
Lead:					
Mine.....metric tons.....	90,000	90,000	100,000	100,000	100,000
Metal, refined.....do.....	85,000	85,000	90,000	100,000	100,000
Magnesium.....do.....	1,000	1,000	1,000	1,000	1,000
Manganese ore.....thousand tons.....	800	800	1,000	1,000	1,000
Mercury.....76-pound flasks.....	26,000	26,000	26,000	26,000	26,000
Molybdenum, mine.....metric tons.....	1,500	1,500	1,500	1,500	1,500
Silver.....troy ounces.....	800,000	800,000	800,000	800,000	800,000
Tin, refined.....long tons.....	30,000	28,000	28,000	25,000	25,000
Tungsten concentrate, about 68 percent WO ₃.....metric tons.....	20,000	20,000	20,000	18,000	15,000
Zinc:					
Mine.....do.....	100,000	100,000	100,000	100,000	100,000
Metal, refined.....do.....	90,000	90,000	90,000	90,000	90,000
Nonmetals:					
Asbestos.....do.....	90,000	90,000	100,000	120,000	130,000
Barite.....do.....	80,000	80,000	90,000	100,000	100,000
Cement.....thousand tons.....	8,000	8,000	10,000	10,500	11,000
Fluorspar.....metric tons.....	200,000	200,000	200,000	200,000	220,000
Graphite.....do.....	40,000	40,000	40,000	40,000	40,000
Gypsum.....do.....	400,000	400,000	500,000	600,000	600,000
Magnesite.....thousand tons.....	700	800	900	1,000	1,000
Phosphate rock.....metric tons.....	500,000	600,000	700,000	800,000	900,000
Pyrite.....thousand tons.....	1,000	1,100	1,200	1,300	1,500
Salt.....do.....	11,000	10,000	10,500	10,000	13,000
Sulfur.....metric tons.....	250,000	250,000	250,000	250,000	250,000
Talc.....do.....	150,000	150,000	150,000	150,000	150,000
Mineral fuels:					
Coal.....thousand tons.....	250,000	250,000	270,000	290,000	300,000
Coke.....do.....	15,000	15,000	15,000	15,000	16,000
Petroleum:					
Crude.....do.....	6,200	6,800	7,500	8,500	10,000
Refinery products.....do.....	5,500	6,500	7,000	8,000	9,000

¹ Estimated.² Mostly diasporic bauxite. Data shown include only the bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons were produced each year for making refractories.³ Converted to equivalent 50 percent Fe ore.

Revised.

of platinum, copper and copper alloys, steel products, and machinery and chemicals. Trade with the French declined momentarily, whereas trade with the West Germans and Italians soared. While continuing to export seamless steel pipes to China, West German firms were negotiating to furnish various metallurgical plants, a Lurgi oil plant, a naphtha cracking plant, and a glass plant, among others. An important deal involving the Italians was the sale and construction of a catalytic reforming oil refinery in Manchuria. A contract was signed with Swedish companies (Atlas-Copco AB, ASEA or Allmanna Svenska Elektriska AB, and AB Svenska Flaktfabrieken) to develop a copper mine and an iron mine in China. An Austrian firm agreed to provide oxygen converters. The British and Italians each have a contract to build a fertilizer plant. The Japanese were furnishing fertilizers, steel products, and steel fabrication and fertilizer manufacturing facilities to Mainland China. Thus, Chinese imports of plants, equipment, and know-how in the mineral-related fields constituted an important part of the overall trade.

TABLE 3.—*Mainland China: Exports of selected metals and minerals to the U.S.S.R.*

Commodity	1962	1963	1964
Metals:			
Antimony..... metric tons.....		2,000	
Iron, pig..... do.....	93,700	154,500	150,300
Lead concentrate..... do.....	100	3,800	
Mercury..... 76-pound flasks.....	34,810	11,600	2,900
Tin..... long tons.....	8,600	4,200	1,082
Tungsten concentrate..... metric tons.....	13,000	12,000	6,000
Nonmetals:			
Borax..... do.....	6,400	6,900	14,000
Cement..... do.....	689,000	373,000	
Fluorspar..... do.....	42,700	39,900	30,700
Salt..... do.....	94,600	103,400	102,000
Sulfur..... do.....	20,100	20,200	25,100
Talc..... do.....	57,700	40,300	40,600
Mineral fuels: Bituminous coal..... do.....	201,000	205,000	202,000

Source: Official trade returns of the U.S.S.R.

TABLE 4.—*Mainland China: Imports of selected metals and minerals from the U.S.S.R.*

[In metric tons]

Commodity	1962	1963	1964
Metals:			
Aluminum.....	1,375	1,500	
Cobalt.....		15	
Copper, rolled.....	245	142	62
Ferroalloys.....	2,000	1,000	600
Iron and steel semimanufactures.....	95,200	88,900	71,000
Nickel:			
Ingot.....	1,020	1,000	997
Rolled.....	57	141	96
Mineral fuels:			
Petroleum refinery products:			
Gasoline.....	764,700	455,400	269,900
Kerosene.....	488,300	476,000	139,100
Diesel fuel.....	378,400	333,200	79,500
Lubricants.....	210,200	134,700	15,200
Greases.....	3,200	3,300	1,000
Paraffin.....	2,500	2,400	100

Source: Official trade returns of the U.S.S.R.

TABLE 5.—Mainland China: Exports of selected metals and minerals to Japan

Commodity	1962	1963	1964
Metals:			
Antimony:			
Ore and concentrate.....metric tons..	712	634	1,328
Sulfide.....do.....	130	(¹)	(¹)
Iron and steel:			
Iron ore.....do.....		22,848	51,497
Pig iron.....do.....	19,678	80,271	997,492
Manganese ore.....do.....	10,154	9,436	6,265
Silver.....thousand troy ounces.....	318		
Tin.....long tons.....	820	1,174	1,454
Tungsten concentrate.....metric tons.....	56	158	317
Nonmetals:			
Alumina shale.....do.....	1,960	510	5,138
Asbestos.....do.....		41	282
Barite.....do.....	1,792	2,210	2,881
Feldspar.....do.....	397	1,103	350
Fluorspar.....do.....	26,518	51,415	69,048
Magnesia clinker.....do.....	5,041	1,514	1,021
Quartz and Quartzite.....do.....	305	540	2,080
Salt.....do.....	309,788	439,263	697,790
Steatite (soapstone).....do.....	5,000	4,944	7,898
Talc.....do.....	2,126	3,335	9,341
Mineral fuels:			
Coal:			
Anthracite.....do.....	16,505	26,337	71,772
Coking bituminous.....do.....	157,875	67,426	156,480

¹ Not available.

Source: Official trade returns of Japan.

TABLE 6.—Mainland China: Exports of selected metals and minerals to Poland

Commodity	1962	1963	1964
Metals:			
Antimony.....metric tons.....	1,000	(¹)	(¹)
Manganese ore.....do.....			20,100
Mercury.....76-pound flasks.....	812	928	1,014
Molybdenum concentrate.....metric tons.....	241	238	319
Tin.....long tons.....	226	199	198
Tungsten concentrate.....metric tons.....	3,400	2,402	1,350
Nonmetals:			
Asbestos.....do.....	4,383	1,077	1,432
Barite.....do.....	7,737	4,990	5,008
Fluorspar.....do.....	14,300	11,200	15,200
Graphite.....do.....	154	150	1,258
Magnesite.....do.....	11,300	15,300	
Sulfur.....do.....	20,000	22,000	19,000
Talc.....do.....	700	1,242	1,080

¹ Not available.

Source: Official trade returns of Poland.

COMMODITY REVIEW

METALS

Iron and Steel.—The Chinese Communists claim that 1965 output targets for iron ore, coking coal, pig iron, crude steel, and steel products were fulfilled a month ahead of schedule.² Most likely, Chinese steel production increased to about 15 million metric tons.

Higher output was mainly achieved through improvements in furnace efficiency and operation of additional rolling mills at existing steel bases, rather than establishment of new steel bases. Smelting proc-

² *Ta-kung-pao* (Peiping), Dec. 23, 1965, p. 1.

esses were intensified, with the introduction of fuel injection in blast furnaces (resulting in reduced coke ratios), greater use of oxygen and magnesia-alumina bricks in open-hearth furnaces, and placing into operations the first locally made top-blown oxygen converter.

The need for employing advanced know-how was shown by efforts to buy foreign equipment and plants. A contract was signed at yearend to obtain a few LD (Linz Donawitz) converters from Oesterreich-Alpine Montangesellschaft of Austria. Negotiations were underway to explore the possibility of purchasing a cold strip mill, a steel tubing plant, and oxygen equipment from West Germany. Contracts were concluded in the fall of 1965 to purchase a medium, light shape mill and wire drawing plan from the Kobe Steel Co. of Japan, possibly for U.S. \$8.33 million.³ Electric furnaces were being bought from the Daido Steel Manufacturing Co. and other Japanese firms.

The Chinese Communists also claim successful trial production of more than 500 new types of steel and rolled steel including many stainless and other alloy steels. Among the new steel products are high-pressure nonrust plates for boilers and fertilizer plants, thick cold rolled steel, durable shaft steel for cars, channel beams for tractors, alloy steelplates for oil cracking, steel tubing for deep oil drilling, and spiral-shape coolers for petroleum refining.⁴

Despite many new products, the need for imports remained serious. Small amounts of pig iron have long been traded with the Soviet Union for finished steel. Western Europe supplied sizable quantities of special steels. Steel imports from Japan, already large, were increasing. The Chinese may import as much as half a million tons of steel products from Japan in 1966. During the Kwangchow Fair alone, held in China in late 1965, the Japanese received bookings (for delivery in April 1966 to March 1967) for 330,000 metric tons of ordinary steels and 27,500 tons of special steels, about twice the previous annual shipments to China. Chinese exports of pig iron to Japan were down perhaps two-fifths from the previous high of about a million metric tons in 1964. Not much Hainan or other Chinese iron ore went to Japan, and coal shipments were only somewhat more than a half million tons.

Ansham, Mainland China's great steel center which may have produced as much as 6 million metric tons of steel ingot and roughly 170 types of new steel products, overfulfilled its 1965 targets 25 days ahead of schedule while completing a number of basic engineering projects. The Chinese Communists claim that the following projects were brought into operation: a primary crushing plant at the Yen-ch'ien'shan iron mine; replacement of spiral classifiers with hydro-tators at various iron ore washing plants, resulting in a 9-percent increase in iron recovery to 83 percent; screening and sizing units at the East Ansham sintering plant; and acid-alkaline pickling unit to complement an existing rolling mill; and a large size oxygen plant to provide oxygen for open hearth furnace operations.⁵

Four of the ten blast furnaces at Ansham (Nos. 4, 7, 9, and 10) were reconstructed.⁶ High temperature corrosion resistant carbon

³ *Japan Metal Bulletin*, Sangyo Press Ltd. (Tokyo), Aug. 31, 1965, p. 1.

⁴ *Jen-min Jih-pao* (People's Daily; Peiping), Dec. 23, 1965, p. 1.

⁵ *Ta-kung-pao* (Peiping), Oct. 26, 1965, p. 1.

⁶ *Jen-min Jih-pao* (People's Daily; Peiping), Sept. 1, 1965, p. 2.

bricks were substituted for refractory bricks in furnace bottoms. New cooling systems were built around the furnaces. The latest kind of automatic viewers were installed at the base of furnaces to keep continual surveillance of corrosion by molten iron. These innovations resulted in prolonging furnace life between repairs by one-fourth. At the No. 9 furnace, the hot-draft temperature was raised from 1,100° C to 1,230° C, coke consumption per metric ton of pig was reduced by about 40 kilograms, and output was raised by 8 percent. Operation of the No. 10 furnace (1,513 cubic meters and Anshan's largest) was improved, bringing pig iron output up to 2,600 metric tons daily.

The Wuham steel center, with two large blast furnaces (1,386 and 1,436 cubic meters), five open-hearth furnaces (one 250-ton and four 500-ton), a sintering plant, three byproduct coke plants, a large blooming mill, and various finished steel rolling mills, was operating at full capacity with the equipment in existence, producing just over 1.5 million metric tons of steel ingot.

The Paotou steel center had integrated operations oriented around a 1,513-cubic meter blast furnace, possibly two 600-ton open hearth furnaces, a large ore concentrator, a byproduct coke plant, and necessary rolling facilities. Steel ingot output probably is on the order of 0.8 million metric tons. Much work was done on coal blending, with more than half of coal needs satisfied by local weekly caking or noncaking coals which greatly reduced the amount of coking coal brought in from Hopeh and Shansi.

The Shanghai steel industry increased output somewhat over that of 1964, in line with greater local industrial activity. Steel ingot production was probably 1.5 to 2 million tons. The Shanghai No. 1 and Shanghai No. 3 plants were specifically cited as having improved operations to reach the national advanced level.

Maanshan steel plant became truly integrated, with a buildup of steel ingot and products capacities since early 1964 to match the pig iron capacity. Maanshan has more than a dozen small blast furnaces of 100 to 250 cubic meters, five converter shops and two open-hearth shops, and presumably two rolling mills. All told, Maanshan is potentially capable of producing more than a million tons of steel products annually. This steel center was singled out as having made basic improvements in 1965 that resulted in large increases of output.⁷

The Shihchingshan-Tangshan-Tientsin-Peiping complex, with an annual capacity of more than 1.5 million metric tons of steel, had a good year. Shihchingshan's pig iron output still came from three blast furnaces (largest is 1,000 cubic meters), but steel output increased as a result of China's first top-blown oxygen converter being placed in operation.⁸

The Taiyuan steel works, located in a new industrial center, was fully integrated and capable of producing more than two-thirds of a million tons of steel yearly. Five blast furnaces were in existence, the largest being 963 cubic meters (also 291 and 146 cubic-meter ones); three 30- to 50-ton open hearth furnaces plus electric furnaces and converters, and corresponding rolling facilities. A coke byproduct fertilizer plant went through its first full year of operation.

⁷ *Ta-kung-pao* (Peiping), Dec. 3, 1965, p. 2.

⁸ *China Reconstructs* (Peiping), Sept. 1965, p. 19.

The Chungking steelworks, with a 620-cubic-meter blast furnace (also 134- and 55-cubic-meter ones), four open hearth furnaces (two 50-ton and two 20-ton), byproduct coke ovens, converters, and rolling mills, is a little smaller than the Taiyuan steelworks. Chungking was thoroughly inspected late in 1965, resulting in technical improvements such as less downtime in open hearth operations, reduction of raw material consumption, and better heat and energy balances. More than 40 new products were made, and a large-size coal grader-mixer was installed. As at most other steelworks, coal blending resulted in greater use of local coals and less consumption of high-grade coking coals obtained from elsewhere.

At the Penshi (Penhsihu or PENCH'I) steelworks in Manchuria, better known for blast furnaces and byproduct coke ovens, steel producing facilities have been gradually built up in recent years. This center is about the size of Taiyuan and Chungking for pig iron but considerably smaller in terms of steel.

Other Metals.—The Chinese Communists have hardly mentioned their colored metals industries in recent years. However, fragmentary information on trade and developments indicated nonferrous base metals had a reasonably good year, whereas the so-called export metals apparently did not fare too well. It was claimed that colored metals in general achieved significant increases in output and that many mining and metallurgical projects in manganese, magnesite, copper, lead, zinc, aluminum, and tin were under construction.

Chinese manganese ore output, ranking fifth in the world, was more than adequate to meet the demands of the steel industry. Hsiangt'an in Hunan, Mukwei and Leip'ing in Kwangsi, Ch'in Hsien and Fangch'eng in Kwangtung, Tsunyi in Kweichow, and Wafangtzu in Manchuria were among the principal producers. There was a small surplus for export. In 1964, Poland imported 20,100 metric tons of Chinese manganese ore, Japan 6,265 tons, and West Germany 3,222 tons. Chromite was in short supply, with Albania furnishing 66,000 tons in 1963. Magnesite-alumina brick was widely substituted for refractory chromite. The nickel shortage was also severe, with imports probably coming from the Soviet Union, Cuba, and France (originating in New Caledonia). A contract to purchase 9,300 metric tons of nickel at \$20 million from Societe de Nickel over a 4-year period was being negotiated in April 1965. The Chinese steel industry consumed only a minor part of the large quantities of tungsten and molybdenum produced in the country.

With regard to nonferrous base metals and light metals, copper and aluminum were the items of short supply. A Chinese nonferrous delegation visiting Japan made some interesting observations on the Chinese copper situation.⁹ Copper was being imported, including 7,500 tons of wires and bars from Chile recently. Much new ore has been delineated, and Chinese copper reserves are believed to be larger than those of Chile. Poor smelting facilities held back mine production. Accordingly, the Chinese delegation was negotiating the purchase of copper smelters from the Japanese. Nonferrous scrap drives have been conducted in China.

⁹ *Japan Metal Bulletin*, Sangyo Press Ltd. (Tokyo), Aug. 10, 1965, p. 2.

According to the Japanese, Mainland China was importing about 1,000 metric tons of aluminum ingot per month, mainly from Canada, Norway, and France.¹⁰ The shortage was not great, however, since aluminum output, primarily from the Fushun plant in Manchuria, was nearly 10 times imports. The Chinese Communists continued to show interest in getting European and Japanese help in expanding aluminum facilities. Late in the year, the Chinese were also interested in acquiring titanium ingots or titanium manufacturing equipment from the Japanese. China had recently been importing about 5,000 tons of rutile annually from Australia. Lead-zinc production apparently was at stabilized levels, and there was little trade.

Little information was available in 1965 on Mainland China's famous export metals—tin, tungsten, antimony, mercury, molybdenum, and bismuth. However, China ranked fourth or higher among world countries in the production of all these metals. Compared with 1963 and earlier, lesser tonnages entered into world trade, implying that output of these metals may have declined or larger quantities stockpiled. Tin output possibly held its own, whereas accountable exports declined considerably. Some electrolytic tin of 99.95 percent was offered for sale. Tungsten production probably dropped to the lowest level in a decade; exports were hard to push, despite rising prices toward yearend. More Chinese antimony regulus was offered in the world markets during 1965, although there were few takers. Kwangsi became a significant new source of antimony ore. Mercury production remained at high levels, but exports declined despite the very high-quality product offered for sale. There was no news on bismuth. During 1964, Poland and Japan each imported 300 to 400 tons of Chinese molybdenum concentrates and the Soviet Union unrecorded additional quantities. Generally speaking, Mainland China was not able to export more minerals because potential buyers questioned Chinese capability to maintain steady supplies.

The second atomic blast on May 14 and another one forecasted for 1966 raised the question of Chinese capabilities and resources of radioactive materials. One possible answer to the puzzle was given by a technician who escaped Mainland China late in the year.¹¹ Three mines were reported to have started production: Maoshan and Chushan in Chuannan County of Kiangsi Province, and Hsiachuang in Weiyuan County of Kwangtung Province. Their combined daily output was said to be 2,500 metric tons of uranium ore. This was partly processed at the Chuchou plant in Hunan Province, and from there sent to Czechoslovakia for further treatment. China paid no cash but gave the Czechs half of the processed uranium. This might explain why the country has been able to produce uranium 235 cheaply, rather than overburden the Lanchow gaseous diffusion plant in Kansu Province.

Mainland China has been producing various kinds of rare earth metals and alloys for use in the optical, metallurgical, and atomic energy industries. Probably the most important producing center was Chinchow in Liaoning Province, Manchuria. The China National Metal & Minerals Import & Export Corp. was offering four-nine purity gallium and selenium for export.

¹⁰ *Japan Metal Bulletin*, Sangyo Press Ltd. (Tokyo), July 31, 1965, p. 3.

¹¹ *Far Eastern Economic Review* (Hong Kong), Dec. 9, 1965, p. 476.

NONMETALS

Asbestos.—Chinese asbestos production probably increased slightly as compared with the previous year. Most of the 10 new projects at Shihmien, Szechuan—the country's main asbestos center—were presumably completed. A new large and rich deposit was reportedly discovered a few years ago, and the Chinese Communists were intent on developing it. When some Canadian asbestos experts were in Szechuan, the Chinese were interested in buying beneficiation equipment from them. Shihmien asbestos is good grade, and some was sold in foreign markets. For example, Poland and Japan imported 1,432 and 282 metric tons respectively in 1964. Most of the roughly 130,000 tons of asbestos produced in 1965, however, was consumed domestically.

Cement.—Significant progress was claimed for the cement industry. It appears that output had risen slightly, and product quality and variety improved considerably. The 11-million-ton cement production estimated for 1965 was still several million tons less than the high claimed for 1960. Small plants contributed 15 to 20 percent of the total output. Internal demand for cement increased somewhat, whereas exports apparently declined. Through 1964, the country had been exporting about a million tons annually, with Hong Kong the leading purchaser and the Soviet Far East an important second. In 1965, however, Hong Kong imported about 400,000 tons in the first 9 months from Mainland China, and the U.S.S.R. may have stopped imports altogether.

Nearly half of the approximately 50 large and medium cement plants (100,000-ton to million-ton annual capacity) were mentioned in the Chinese press during 1963–65, and it was claimed that more than 10 modern plants (200,000 to 700,000 tons) and some 80 small plants (less than 100,000-ton size) had been built in the last few years. Some of the larger newly built plants are Tatung in Shansi, Kunming in Yunnan, Yao Hsien in Shensi, Yungteng in Kansu, Chungking in Szechuan, Kwangchow in Kwangtung, Liuchow in Kwangsi, Kweiyang in Kweichow, and Mutanchiang in Kirin.

Development and expansion of mines and quarries for cement production continued. Sufficient limestone reserves had been developed at the K'ungshan quarry near Nanking to meet the needs of the Chungkuo and Kiangnan cement plants in Kiangsu for 50 years. The Huangchinshan limestone quarry in Hupeh developed for the Huasin cement plant was brought into full-scale production around August; it was said to be highly mechanized and equipped with electric shovels.¹² The Fushun cement plant in Manchuria continued to use byproduct oil shale as a raw material. Increasing amounts of clinker and slag were being used in concrete mixing. Gypsum has never been a problem; indigenous mines provided about 400,000 tons of gypsum consumed in cement manufacture in 1965.

Fertilizer and Chemical Materials.—To cope with the food problem for a growing population, continued emphasis was placed on developing fertilizers and chemical raw materials. Extraction of pyrite and phosphates were given high priority. The apparent substantial in-

¹² *Kung-jen Jih-pao* (Workers Daily; Peking), Sept. 1, 1965, p. 3.

crease in overall fertilizer output indicates that pyrite production topped 1.5 million metric tons. The only two known large pyrite mines in operation were Hsiangshan (near Maanshan) in Anhwei Province and Yingte in Kwangtung Province, which together probably provided half of the national output. Many small pyrite mines were being worked, and one additional large, high-grade deposit was under development. A sizable tonnage of pyrite mined in Szechuan and Shansi Provinces was converted to elemental sulfur. Byproduct sulfur from nonferrous ores was utilized to some extent to supplement pyrite in sulfuric acid manufacture.

Phosphate rock production presumably increased somewhat over 1964. The principal mine was Chinghsiang in Hupeh Province; a second important deposit—K'aiyang in Kweichow Province—was under development. Low-grade phosphate ores from Liuyang in Hunan and Nantung in Kiangsu were successfully converted into 18 percent plus P_2O_5 grade chemical fertilizers at local plants.¹³ There were many other small producers in southwest China. However, indigenous output met only about half the demand. Phosphate rock imports from Morocco alone were 778,406 metric tons in 1964 and 553,165 tons in January–September 1965 (Moroccan figures). Some apatite also came from Laokay, North Vietnam.

Chemical fertilizer production in Mainland China during the first 11 months of 1965 reportedly topped that for all of 1964 by 2.79 million metric tons.¹⁴ This would imply that the country produced at least 5 million tons of all chemical fertilizers, perhaps a little less than half phosphatic and most of the rest nitrogenous. There were about 11 sizable phosphate plants, headed by Nanking with possibly half-million-ton annual capacity and including a new plant—Chuchow in Hunan. Nanking, Dairen, Lanchow, Kaifeng, and Wuching (in Shanghai) were among the larger nitrogenous fertilizer plants. Many dozens of small fertilizer plants were also in existence.

Mainland China can consume far more chemical fertilizers than what is produced. Even the Chinese themselves talk about the need for 15 to 20 million tons of phosphatic fertilizers, not to speak of other fertilizers. Increasing imports were made to relieve the shortage—about 1.2 million tons in 1964 and 2.5 million tons in 1965 (two-fifths from Japan and the rest Western Europe). Imports from Japan are expected to be 50 percent greater in 1966, as compared with 1965. A number of European-built fertilizer plants have been contracted for delivery in 1965–66, including a large plant from Humphreys & Glascow, Ltd., of the United Kingdom for Luchow (southwest of Chungking) and another one from the Italian firm, Società Montecatini.

With pyrite as the main sulfur-bearing raw material used in making sulfuric acid and fertilizer in Mainland China, it was possible to save the elemental sulfur extracted for other vital uses and for export. During 1965, about half of the roughly 250,000 tons of sulfur produced came from pyrite and the other half was derived from 20-percent sulfur ores. In 1964, the Soviet Union imported 25,000 tons of sulfur from China, and Poland and Japan, 19,000 and 10,500 tons respectively.

¹³ *Ta-Kung-pao* (Peiping), Nov. 2, 1965, p. 1.

¹⁴ *Ta-kung-pao* (Peiping), Dec. 12, 1965, p. 1.

With regard to potassic fertilizer raw material, the progress in exploiting a multibillion-ton carnallite deposit located at Charkhan Lake in Tsaidam Basin, Tsinghai, is not known, although extraction was started many years ago.

Fluorspar.—Chinese fluorspar production, which ranks high by world standards, apparently increased somewhat, as compared with that of the last few years. Output from Chekiang and north China remained steady, but Kwangsi Province has become a significant new source. Slightly more than half of the Chinese fluorspar was exported. During 1964, importing countries gave the following figures, in metric tons: Japan, 69,048; U.S.S.R., 30,700; Poland, 15,200; and West Germany 3,218. In mid-1965, the Kamisho Co. of Tokyo, which specializes in fluorspar, concluded on behalf of the Japanese consumers a long-term contract with the Chinese, whereby China is to supply all that Kamisho needs for an indefinite period beginning in April 1966. Domestically, fluorspar was consumed in the manufacture of steel, aluminum, and ceramics, and in atomic energy.

Magnesite.—Southern Manchurian magnesite found in a belt extending from Tashihch'iao northeast to Lienshankuna continued to be of great world significance. Output of perhaps a million tons was on a par with the previous year and the probable peak in 1960. The Anshan Steelworks pioneered the use of magnesia-alumina refractory bricks for iron and steel smelting in China, and the practice has been extended to most other large steel centers. Despite growing domestic demand, small quantities of magnesite and magnesia have been traditionally available for export.

Salt.—Mainland China retained its position as the world's second largest producer of salt, after the United States. The national target was achieved 20 days ahead of schedule and output, substantially greater than in 1964, was claimed to be the highest in the last 5 years.¹⁵ Although most salt was consumed for food purposes, industrial demand was rising and it was necessary to stress quality along with greater output. Byproduct recovery made significant headway, in terms of the production of potassium chloride, bromine, boric acid, iodine, and barium chloride, etc.

Operating conditions were particularly good for the four main producing provinces—Kiangsu, Shantung, Hopeh, and Liaoning—which furnished nearly three-fourths of the national output. Last year was a bad year for these provinces because of excess rainfall. In contrast, most salt fields surpassed their production quotas in 1965, including all the fields in Kiangsu, the Chinchow field and the P'itzuwo chemical plant in Liaoning, the Yangk'o, Shoukuang, and Ts'aiyangtzu fields in Shantung, and the Hanku, Nanp'u, and Tawop'eng fields in Hopeh.¹⁶

Many technical changes were made during the year to improve operations, both in the coastal salt fields and in the salt wells and rock salt mines in southwest China. More dredges, trawlers, cable traction devices, tractors, small cars, and scrapers were employed. Strong dikes were built in some salt fields in Liaoning Province where a supply of rocks was easily available. At the Tzuliuching salt wells

¹⁵ *Jen-min Jih-pao* (People's Daily; Peiping), Dec. 25, 1965, p. 1.

¹⁶ *Jen-min Jih-pao* (People's Daily; Peiping), June 15, 1965, p. 1.

near the gasfields of Szechuan Province, operations were improved by lengthening the pipe sections, decreasing the pipe diameter, recycling more of the mother liquor, and cutting down on natural gas consumption. In the rock salt mines of Kuming, Yunnan Province, the double-pipe-water-solution method was introduced in place of solid rock mining with great savings in cost.^{17 18}

Higher production stimulated slightly greater exports. In 1965, Mainland China exported roughly a million metric tons of salt, mainly to Japan. In 1964, Japan imported 697,790 metric tons of Chinese salt and the Soviet Union, 102,000 tons.

Other Nonmetals.—Barite production was maintained at a significant level—about 3 percent of the world total. Despite meeting the growing needs of oil drilling, roughly one-tenth of the barite was exported. Approximately two-fifths of the high-grade steatite talc from Taling, Liaoning was exported, mainly to the U.S.S.R. and Japan. A surplus of borax continued, although no information was available on the very large boron-bearing lake deposits in the Iksaydam area of Tsaidam, Tsinghai. Erection of a number of new glass plants called for new supplies of high-grade silica. Polished marble slabs became established as a new nonmetal export product.

MINERAL FUELS

Coal—The Chinese Communists claim that their 1965 coal production target was fulfilled during the first 10 days of December.

Based upon data on the 71 large coal mining enterprises directly under the Ministry of Coal Industry * * * average productivity increased by 14 percent over the previous year, ash content of coals went down significantly, and timber consumption per 10,000 metric tons of coal output decreased by more than 30 cubic meters.¹⁹

Through shortening construction time, about 16 "pairs of new coal shafts" were scheduled to be brought into production in 1965;²⁰ this would mean roughly 10 million tons of additional annual capacity. The above information indicates improved performance and slightly higher production.

Of the approximately 300 million metric tons of coal estimated to have been produced by Mainland China in 1965, the bulk was bituminous coal with only about 20 million tons as anthracite. Hydraulic mining may have contributed 20 to 25 million tons of output. The big seven coal mining centers (Fushun, Fuhsin, Kailan, Huainan, Chihsi, Hokang, and Tatung, roughly in descending order) each produced 10 to 20 million tons and together some 100 million tons. More than a dozen mines were in the 2- to 9-million-ton range, and many others were in the 1- to 2-million-ton range. Rest of the country's coal output came from numerous small mines with annual capacities from 100,000 to 1 million tons.

The Chinese press gave some general indication of the production status for certain coal producing areas. Eight large mines of Liaoning Province (includes Fushun and Fuhsin) reportedly achieved their combined 1965 targets 28 days ahead of schedule. The Tatung

¹⁷ *Ta-kung-pao* (Peiping), June 25, 1965, p. 2.

¹⁸ *Ibid.*, Dec. 11, 1965, p. 1.

¹⁹ *Ta-kung-pao* (Peiping), Dec. 23, 1965, p. 1.

²⁰ *Jen-min Jih-pao* (People's Daily; Peiping), June 16, 1965, p. 1.

coal mines in Shansi Province presumably met their quota 25 days ahead of schedule. The Huainan coal mines in Anhwei Province underwent modernization, particularly the Hsieh-chia-chi mine, leading to greater productivity. During the first 11 months of 1965, output of the Pingtingshan mines (supplier of coking coal to the Wuhan Steelworks) in Honan Province was 69 percent higher than the corresponding period in 1964. The Yangchuan mines in Shansi also topped its 1965 target in early December. Pingtingshan and Yangchuan are 5 to 9 million-ton mines. Many small mines in Szechuan Province were streamlined to raise combined capacity by about 3 million tons or about half of existing annual capacity.

Various specific developments were reported. The Fushun mines underwent substantial mechanization in the underground part of its operations, with the installation of centrally controlled belt conveyors and a hydraulic transport system to bring coal up from 600-meter depth. The Ch'inghomen vertical shafts of the Fuhsin mines, rated at 600,000 tons of coal yearly, were brought into production. The Meiyukou pit of Tatung mines was further mechanized, with "cutter loader" breaking and loading the coal onto conveyor belts. The 900,000-ton Shuiku coking coal mine of Fenhshiao in Shansi, the 600,000-ton Wanhouyao mine in Huaipai area of Anhwei, and the half million-ton plus Hungyuan mine in Szechuan were placed in operations near yearend. The 450,000-ton Peit'outsui vertical shafts of the Yangchuan mines became operative, along with similar capacity vertical shafts at the Tunghua mines, Kirin. The Shihch'echieh mines of Shansi, in attaining a per capita daily output of 2.456 metric tons, was said to have achieved the highest productivity in the country. The Chinshi mines, China's most famous anthracite producer, set a record of 351 meters per month in tunnelling, and its drilling crews were sent to many other mines for demonstrations. The Shuangyashan mines in Heilungkiang Province has been using much concrete supports. The Chiaotso anthracite mine in Honan was finally dewatered.

Much was accomplished in improving coal quality and extraction indexes. Large coal beneficiation capacities have been developed in recent years and most coal bases, particularly the new shafts and pits, have such facilities. There was considerable emphasis on washing and blending of coking coals to meet the needs of the steel industry; local weakly and noncaking coals near the steel centers were used as much as possible. A great drive was in progress to conserve quality coal for the most appropriate uses and to achieve economies in the consumption of coal. These efforts mean better efficiencies rather than overall shortage. The supply of coking coal remained tight, however, the Chinese have been shipping increasing quantities of coking coal and anthracite to Japan. In the first 10 months of 1965, the Japanese received about 450,000 metric tons of Chinese coal from mines like Chunghsing and Fengfeng. Compared with production, it is evident that the country's coal exports were still negligible.

Petroleum.—The Chinese Communists claim that Mainland China's 1965 crude oil target was achieved 47 days ahead of schedule and that goals for production of kerosene, gasoline, diesel fuel, and lubricants were fulfilled by November 4.²¹ A conservative estimate of crude oil

²¹ *Ta-kung-pao* (Peiping). Des. 23, 1965, p. 1.

output for 1965 would be 10 million metric tons, possibly a million tons more than refinery output.

Additional production altered the overall supply position, as the country truly became virtually self-sufficient in oil. Imports, primarily consisting of refined products and from the Soviet Union, were much smaller than a few years back; the amount brought in from the U.S.S.R. was probably of the same order as in 1964 (504,900 metric tons), if not lower. Rumania and Albania apparently were no longer furnishing China with much oil. On the other hand, Chinese offers to sell crude oil to Japan appeared to be serious, and there was talk about extending a pipeline from Manchuria to North Korea. More oil was distributed to the civilian economy, and the price of gasoline was cut 18.6 percent.²²

The main factor which improved the oil supply was the continuing success of the Tach'ing field around Saert'u just northwest of Anta, which in turn is north of the Harbin-Tsitsihar Railroad in Manchuria. Much specific information was reported on this field, and Tach'ing was often mentioned in the press as the example to emulate by other industries. Discovered in 1959, Tach'ing started large scale production in 1963 and steadily expanded output of crude oil to probably more than 3.5 million tons annually. A large oil refinery has been built locally.²³ But its capacity was not large enough to handle crude output. Surplus crude oil was being shipped out as is in a special pipeline, heated to prevent the high paraffin crude from solidifying. The Chinchou sub-field is said to be in the same district.

Many articles described the technical achievements of Tach'ing.²⁴ Drilling techniques have attained efficient levels, with good straight holes drilled in record speed, very high recovery of cores, and successful wells to more than 4,500 meters depth. Steel casings for deep holes are being partly made by Chinese plants. After 1.7 million analyses and "20,000 kilometers of curves on graphs," the early simultaneous (multiformation) water injection method was adopted, which reportedly had paid off in steady and very high level production since the beginning of operations. A new and smaller "Christmas tree" assembly was introduced to solve the valve problem. Three separate oil refining units were installed. Tach'ing with about 40,000 workers had become the training base for supply technicians to other fields.

The Karamai complex (oil field and refinery at Karamai and another refinery at Tushantzu) may have reached a stabilized annual production level of 1.5 million to 2 million tons. More than a dozen projects were completed, including the new Karamai refinery²⁵ which was undoubtedly responsible for large increases claimed in the production of petroleum products.

The Yumen oil field has long been stabilized at the 1.5 million to 2 million ton annual level. Surplus crude went to the Lanchow refinery in the same Province. Six new installations were placed in operation in 1965, mainly to improve quality and diversification of products, including one to up-grade lubricants and another to convert or liquefy waste refinery gases into gasoline.²⁶ Most equipment was made in the

²² *Petroleum Press Service* (London). Vol. XXXII, No. 4, April 1965, p. 155.

²³ *Ta-kung-pao* (Peiping). Jan. 1, 1966, p. 3.

²⁴ *Ta-kung-pao* (Peiping). Jan. 10, 1966, p. 1.

²⁵ *China Reconstructs* (Peiping). January 1966, pp. 26-30.

²⁶ *Jen-min Jih-pao* (People's Daily; Peiping). Dec. 31, 1965, p. 3.

machinery plant attached to the Lanchow refinery. Lanchow also produced increasing quantities of ammonium fertilizers (mainly urea).

The Shanghai refinery's thermal cracking plant was producing at higher rates after having been enlarged. Shanghai has become an important center for producing oil refining and drilling equipment. The Szechuan gasfields and the smaller oilfields were presumably operating at the previous year's levels, with better distribution of products. There was hardly any news of Tsaidam, which was considered a major field a few years back.

The Fushun shale oil center in Manchuria, with 7,000 workers, produced about 2 million metric tons of refined oil—roughly the same as 1964. Modernization of the No. 1 refinery resulted in much more efficient operations. There was no news on the Maoming shale oil center in Kwantung, reportedly completed a few years back and probably rated at more than a million tons annual capacity.

Much drilling equipment as well as many rail, truck, and river and coastal tankers were produced, but more significant was the large amount and variety of refinery equipment made. Mainland China was able to make most of the simpler types of equipment needed in the oil industry. But need for imported refinery equipment persisted. The West German firm, Lurgi Gesellschaft, was supposed to have delivered a \$12.5 million oil cracking and olefine separation plant. Orders were also placed with the Italian firm, Sham-Progetti (subsidiary of ENI or Ente Nazionali Idrocarburi), for a \$9 million refinery to be installed in 1966; a late 1965 report states that the equipment had arrived and Italian experts were supervising construction of this 100,000-ton catalytic reforming plant somewhere in Manchuria.²⁷

BASIC FACTORS AFFECTING DEVELOPMENT

TECHNICAL MANPOWER

Technical manpower for mineral resource development in China is expected to remain in short supply in the years ahead, particularly high-caliber technicians, managers, and engineers. However, scientific and industrial education is steadily moving ahead despite growing emphasis in political studies.²⁸ The Chinese have long been known as good artisans and technicians, and general industrial experience will improve with additional mines and plants in operation. Technical people in the academic circles will get more practical experience, and production workers will get more formal schooling in trade schools and colleges. Specialized technicians will also come out of the research institutes and universities, although not as many as might be needed.

Experience in developing countries, particularly China, has shown that given good management and nucleus of experienced workers, adequate new workers can be trained in 2 to 3 years to run specific mines and plants. Also, larger numbers of workers can be trained in actual operations than in schools, training centers, and demonstration mines

²⁷ *Far Eastern Economic Review* (Hong Kong), Nov. 4, 1965, pp. 192-193.

²⁸ Cheng Chu-yuan, *Scientific and Engineering Manpower in Communist China 1949-63*, National Science Foundation, NSF 65-14, U.S. Government Printing Office, Washington, D.C., pp. 1-588.

and plants. The Chinese Communists realize these facts. A concerted program to disseminate information to wider audiences has been carried out through plant meetings and regional or national technical conferences. Specialists are dispatched from established facilities to start new operations, special efforts are made to train new workers, library services are built up, and workers and technicians are encouraged to exchange know-how among themselves.

This approach means that many partly trained workers can be developed for national construction. For example, large numbers of semiskilled workers have been trained for mineral exploration, and the working force in mining and metallurgy has been expanded greatly in the last decade. There may be overemphasis on quantity at the expense of quality, but from the ranks of half-trained workers will also come the good ones who can be given advanced education. These are the kinds of things that China can do by itself. More rapid progress can only be achieved through technical assistance and learning from the outside world.

Although Chinese scientists have published many articles on nuclear subjects at the Soviet atomic energy research center of Dubna and many scholars have international reputation in other fields, such experts are comparatively rare and technical aid from foreigners would be most helpful. China cannot train topflight specialists and workmen familiar with the most advanced techniques. Here the Soviet Union and other industrialized countries can help. Soviet aid actually launched the present industrial program, when thousands of experts came with the equipment. By the same token, their withdrawal was most disruptive, because the Chinese had not quite learned to do things and, in many cases, had received only part of the equipment. The Chinese have since built up a reasonably successful technical program based upon indigenous capabilities. Without foreign technical manpower and other assistance, however, the rate of progress can attain only certain standards. Accordingly, the Chinese Communists are looking more toward the technically advanced countries for help.

In evaluating the availability and capability of Chinese manpower for mining and industrial development, it can be concluded that sufficient numbers of ordinary technicians and workers can be trained; high-level personnel will be grossly inadequate; the development of the simpler, basic aspects of industry will not be held back for lack of technical manpower; the more complicated aspects of industry cannot be efficiently handled because of deficiency of experts; and foreign experts particularly from the free world will be badly needed.

INDUSTRIAL EXPERIENCE

China is neither too advanced nor totally backward in industrial experience. Historically, the Chinese possess traditional know-how of small-scale mining and metallurgical operations. For example, extraction and smelting of iron and copper have been done for thousands of years. The Chinese have left lead slag dumps in southwest China and adjoining southeast Asia in the search and extraction of silver. They have long had good knowledge of ceramics, bricks, and paints. Such background represents a kind of industrial experience, although the scientific basis for processes and techniques was seldom

understood in bygone years. The industrial revolution bypassed China, and it was the 20th century before a few large-scale mines and industries were developed under Western and Japanese influence.

Despite several decades of wars and unrest which followed, some of the industries established were reasonably efficient by world standards. Unlike many other less-developed countries, therefore, China has had a nucleus of mines and industries for years. The world-famous Anshan steel enterprise, a number of large coal mines in Manchuria and north China, and tin, tungsten, and antimony operations in southwest China are good examples of decades of experience. Before the Communist takeover in 1949, Anshan was already a steel base with a capacity of over 2 million tons, the Chinese coal industry had topped 60 million tons per annum in capacity, and the export metals were world famous. China also had a good foundation in power, chemicals, transport, and construction materials which affect development of mineral industries.

During the last 17 years, the Chinese Communists made significant progress in building up their technical and industrial capability. Starting from a few hundred geologists, they now claim several tens of thousands of "geological" workers—a work force that has uncovered a number of major mineral deposits. Drilling experience with regard to exploration and mining has reached fairly high levels, with the somewhat simple, predominantly locally manufactured equipment at hand. Capability to build standard-type plants by various design and construction institutes has advanced rapidly. Many basic materials can now be efficiently produced, but experience in making more complicated products varies inversely with the complexity. Thus, for example, somewhat simple steel shapes can be readily made, whereas many complex shapes cannot.

In assessing Chinese industrial potential, specific mineral and related industries as well as general technologic levels should be examined. The author has reviewed the state of the art for mining and metallurgy in Communist China for the American Association for the Advancement of Science (AAAS).²⁹ Some highlights might be mentioned. The so-called modern mines are fairly up to date from the engineering viewpoint, although lagging considerably behind the best Western practice in productivity and mechanization. Opencut mines in particular are not up to Western standards, with heavy use of labor in smaller mines. Milling practices in fundamental processes are of good quality, but the Chinese have been slow in adopting the most advanced techniques because of the lack of international contacts. Knowledge in metallurgy varies according to field and is stronger in the extractive area.

Coal mining in China is fairly efficient by Oriental standards, especially underground mines. Coal cleaning and carbonization are not too up to date. Blast furnace practice is reasonably good, whereas steel smelting and rolling are far behind United States and Japanese standards. Oil extraction and refining technology is fair in both cases. Knowledge of cement is adequate, but experience in other non-metallics is weak. In nonferrous metals, the Chinese are reasonably proficient in small- to medium-scale operations, but they need to learn

²⁹ American Association for the Advancement of Science. *Sciences in Communist China*. AAAS Pub. 68, Washington, D.C., 1961, pp. 687-738.

a great deal in large-scale operations and modern smelting and manufacture of metal products.

These examples show that the country possesses fundamental experience in industrial operations and, while the Chinese may be expected to move ahead, that the rate of development will be determined by the availability of capital and foreign aid, among other factors.

INTERNATIONAL CONTACTS

The abrupt withdrawal of Soviet technicians and technical aid brought home to the Chinese not only the vital importance of building up capabilities from within China but also of obtaining assistance from as many alternative foreign sources as possible. Virtually all of the limited number of topflight scientists and engineers had received advanced training from foreign countries, and these men are in charge of China's technical and mineral development program. Thirst for international scientific knowledge was evident long before the Communists came into power, and the need was accentuated. To satisfy the requirement, good technical libraries were organized and up-to-date periodicals and literature were obtained wherever possible. Although the international publications exchange program was greatly curtailed since 1960, in part because of China's reluctance to release its own technical publications, there is no question that knowledge from advanced countries was and will be sought.

Even though Soviet influence in developing Chinese industries had greatly declined and China had fully paid off her debts to the U.S.S.R. by early 1965, many important projects were started by the Soviets, such as the Tach'ing oilfield in Manchuria, Wuhan steel base in Hupeh, Paot'ou steel base in north China, and nonferrous projects in Ch'in-ling Mountains.

The void left by the Soviets was partly filled by continued technical assistance and cooperation with other East European countries. Among other things, the Czechoslovaks were reportedly helping in uranium extraction in southeast China, the Rumanians in oil extraction and refining, the Poles in coal and nonferrous metals, the East Germans in coal and chemicals, and the Bulgarians in lead-zinc. All these countries were also training Chinese technicians. In general, however, the total effort has not been too great.

The Chinese are increasingly aware that combing literature and getting token assistance from Communist countries are not adequate in this age of rapidly advancing technology. The record is clear that China has not moved ahead in mineral resource development as quickly as many other countries. Probably this is why more arrangements are being made to get West European and Japanese firms to build mines and plants in China and bring in the know-how with them. While this trend should continue, the shortage of foreign exchange dictates limited expenditures on items such as model facilities and materials. Many examples of obtaining such assistance are given in the section on "Current Status of the Mineral Industry."

How much the Chinese will do in seeking technical help, inviting foreign firms to do business in China, and visiting abroad, particularly the free world countries, will have an important bearing on the rate of progress for the mineral industry. Although technical and economic aspects seem clear, the controlling factor may well be political.

TRANSPORT AND POWER

The close relationship between transport and mineral resource and industrial development is self-evident, since low-unit-value raw materials must be obtained from the source and products ultimately delivered to the markets. China's transport system has always been very weak compared with that of industrialized countries. Total railroad mileage as of early 1965 was only about 33,600 kilometers, mostly in the coastal, high-population areas. Since 1958 the increase has been merely some 2,000 kilometers. Outstanding developments of the last decade were the completion of railroad all the way from Shanghai to Urumch (Sinkiang), building of certain double tracks in northeast and north China, and construction of a few lines to southwest China. That so much mineral and passenger traffic has been carried by such a limited mileage of tracks reflects good management. But facilities are severely strained; half a billion metric tons of mineral materials is moved annually for average distances of 500 kilometers (order of magnitude). New mining regions and industrial centers must therefore be served by new railroads. To achieve an industrial growth of 50 percent over the present gross national product would probably require that railroad mileage be pushed up to more than 50,000 kilometers, mainly to western China.

Other means of transport complement railroads to varying degrees. Trucks are able to travel over perhaps half a million kilometers of highways of variable quality. Trains of oil tankers and other goods have been pulled by trucks on highways. But truck haulage has never been important in China for many reasons and should only be considered a secondary factor in the shipment of mineral products with advantages in short haul. Coastal shipping of mineral and related products might gain in importance by linking certain coastal ports like Shanghai, Tientsin (Tangku), Tsingtao, Chinchow, Dairen, and Kwangchow (Canton) which have access by railroads to the mines and industries. The factor of internal waterways, particularly in northern, central, and southwest China, should not be ignored. There is much unrecorded traffic of this type for distributing raw materials and goods to many small places not served by railroads and trucks. These waterways are usually in already congested areas, and expanding the system is difficult.

Although the power industry has had a small but somewhat notable past, in the last 5 years growth has been limited. Power production is still below 50 billion kilowatt-hours, less than the maximum figure claimed during the Leap Forward. Nonetheless, electricity is reaching more industries and households, rural electrification has been pushed, and overall generation efficiencies have been achieved. The Chinese have been able to make larger generators, the maximum being about 100,000 kilowatts in capacity. The mighty San-men-chia hydro scheme in upstream Yellow River was never quite completed after Soviet technical aid was withdrawn, and because of the location it really does not have much immediate bearing on mineral industries. More important are the many coal-fired powerplants that generate electricity for use by the mineral, metallurgical, and related industries. The big coal mines do not have an electricity problem for operations. Generally, enough power is also provided for basic industries like steel,

chemicals, and cement. But other kinds of mines and industries may experience shortages both in the development and operational stages. Some refineries and metallurgical plants may not even be built for lack of electric power. The main obstacle in providing additional power seems to be capital, for the Chinese are capable of building the generating plants necessary for mineral and industrial development.

CAPITAL AND MANAGEMENT

Centralizing capital for industrial development in Communist China is not necessarily difficult, since funds can be easily budgeted in a Communist economy. Sometimes allocated funds not spent might even bring complications in management. However, what this capital can do in creating industrial capacity, particularly up-to-date facilities, is another matter. For one thing, the turnover of capital is not great and funds must generally come from within the country. In Communist planning, a certain percentage of the GNP (such as the \$4 billion gross estimated for mineral and related industries) can be diverted for capital construction; or profits from some enterprises can be used for making up losses of others or for expansion of existing or new enterprises. The Communist Chinese have long had some kind of profit-or-loss system in their industrial plants and mines, and in this respect the approach is slightly different from that of certain East European countries. But the tendency to perpetuate or carry less efficient enterprises and indirectly penalize good ones is similar. The result is that capital normally going into construction of new facilities has to be used for maintaining or streamlining existing capacity, thus slowing up growth.

Like other Communist countries, Mainland China's planners really do not understand economics in the Western sense. Capital formation is thought of more from the viewpoint of budget rather than capability derived from accumulated profits. Controlled prices are a way of life. Amortization and depreciation are not adequately considered in replenishing capital and equipment. Taxation of enterprises is often a matter of negotiation, and the inevitable result is that the good enterprise is taxed more than the bad one; in effect this removes incentive. Although shortage of raw materials would be keenly felt, the depletion factor in mineral exploitation is hardly considered. Economic statistics can be juggled to meet quotas and standards. Technologic performance is overshadowed by fulfillment of plans. To the Chinese Communists, overall capacity rather than effective and up-to-date capacity and total output rather than low-cost output are the important criteria. Fundamental efficiency and viable enterprise are not stressed in the usual manner. The Chinese try to compensate this by "technical indexes," "model plants, mines, and workers," "emulation drives," etc., which possibly show short-range results but clearly no great long-range advantages.

Lack of cost-efficiency concepts lead to wasteful management practices and reduced capability for plant expansion. The Chinese repeatedly have used established enterprises to train workers for new ones at the expense of downgrading work quality and with no provision to write off the cost. Efficiency gives way to bureaucracy so that materials and supplies are invariably short; projects are held up while surplus equipment may be idle elsewhere; and sometimes plants

become obsolescent before completion. Badly managed enterprises mean small returns on capital investment. Extreme shortage of foreign exchange limits imports of equipment and know-how, and hence improvements in technology. Political considerations and policing of operations override normal concepts of good management. Because enhancing national power is more important than raising living standards, mines and industries related to the former receive better treatment. The Chinese do fairly well in the simpler type of industrial operations, but become progressively weaker in more complex enterprises, for technical as well as management reasons.

In general, capital formation and management capabilities in Communist China for developing mineral industries are such that while the country has many difficulties in achieving long-range planned objectives because of built-in weaknesses of the Communist system, short-range objectives of about 5- to 7-percent annual increase in production can be attained, particularly for certain selected branches of industry, even though certain practices are wasteful, inefficient, and ultimately limiting to further expansion.

SUMMARY OUTLOOK

RESOURCE POSITION

Communist China seems to be more than self-sufficient in many minerals, both for the present and for the future. The coal-iron base, including coking coal, is very strong. Moderate resources of petroleum have already been discovered. Manganese, tungsten, and molybdenum are abundant, whereas copper, lead, and zinc reserves seem to be only large enough for medium-scale operations and chromium and nickel resources are meager. Although discoveries of porphyry copper have been claimed, a great shortage of refined copper now exists and substitution by aluminum to the extent feasible is contemplated. The potential for light metals is good, although production is still relatively low. A number of export metals are world famous, but these do not have much bearing on the economy except for earning foreign exchange. In nonmetallics, the salt supply is excellent, sulfur is moderate, phosphates need development, fluorite, graphite, magnesite, and talc are well known in world markets, considerable cement is produced, and asbestos and barite have grown to be sizable industries.

Because of the country's large territory, varied geological and geographical conditions, limited transportation, and uneven population distribution (80 percent in eastern third of country), there are many regional factors affecting mineral development. Manchuria has often been referred to as the Ruhr of China, with the Liaotung Peninsula alone having about one-third of the country's industrial capacity. Three of China's most famous industrial complexes are located here, namely Tach'ing oil, Anshan steel, and Fushun coal. However, the relative importance of Manchuria has been declining as a result of efforts to build up the rest of the country. Neighboring north China with its vast coal and iron resources has been steadily gaining in stature; and an industrial belt stretching from Chingwangtao west through Tangshan, Tientsin, Peiping, Tatung, and Paotou is taking shape. Sian, in an area of rich mineral resources, is being groomed as a springboard to development of both the northwest and the south-

west. Central China has the Wuhan heavy industry base and the Shanghai light industry base. Southeast China is the heart of the tungsten and antimony industries, with a new industrial area being developed in Kwangtung Province. Southwest China has tin, copper, mercury, and some oil and gas. The vast northwest is yielding increasing quantities of petroleum, with the Karamai and Lanchow-Yumen centers. Although the Chinese will try to disperse industries, a dozen or so half-built or established centers will remain vital and continue to be most vulnerable.

MANAGEMENT TRENDS

Despite the many weaknesses of Communist management, mineral resource development has made significant headway, and progress should continue. Fundamental policies have had and will have a profound effect on the future course of events. In early Communist Chinese planning, natural resources were given a prominent position and the policy has not wavered except that due recognition has been given to agriculture and light industries. The Chinese are finding out that maturity and sophistication of industries require a new look at management practices. In the past, management had been through dual authority with equal emphasis by party member and technical supervisor. It appears now that technical matters will be left more to the manager in the future. During the Leap Forward, many inefficient mineral and other enterprises were created for expediency; most have since been discarded and the trend is to run enterprises more along conventional lines.

The Chinese Communists have always been internationally minded in politics and nationalistically minded in economics. Desire to build from within was strengthened monetarily by the sudden departure of the Soviets. Patriotism and the philosophy of "for the good of the country" are exploited to the hilt. A spirit of cooperation as well as spying on others is instilled in the worker, who is made to feel that a mine or plant belongs not only to the state but also to him and he must do the best for it. Contests in performance are staged among work units. Good work is rewarded more through recognition rather than compensation, and delinquencies are punished. There has been a continuous "production war" with regard to both operations and technology, which might well lead to letdowns or breakdowns eventually. Relaxations can be expected periodically, but most basic management concepts will be retained except that more monetary incentives might be introduced. There will be a greater tendency to eliminate inefficient enterprises. But bureaucratic hoarding of equipment, supplies, and technical manpower is expected to show little change. An effort will be made to adopt some Western management practices. Lacking the efficiency of free enterprise management, the Chinese Communists nonetheless will be able to achieve a fair degree of success with their system although probably often below expectations.

MAJOR INDUSTRIES

Forecasting the 1970-75 period, China is expected to maintain its position as one of the three leading world producers of coal together

with the United States and the Soviet Union. In some years, coal output may reach 500 million metric tons. Coal will continue to be the country's principal energy source and should support a sizable thermoelectric power industry. The oil industry may well blossom out into a medium-sized industry, possibly on a par with that of Indonesia. Still in short supply, oil will be significantly militarily, indispensable to passenger and short-haul traffic, and secondary to coal for power and energy.

Sometime in the early 1970's yearly steel output is expected to reach 20 to 25 million metric tons, somewhat less than half that of Japan and ranking about sixth or seventh in the world. The industry will be capable of making many kinds of steel products, but still considerably weaker in rolling and fabrication than industrialized nations. The related machinery industry can also make most basic products and yet lack sophistication. With regard to the ferroalloy or steelmaking minerals, tungsten, molybdenum, and manganese will continue to be significant by world standards.

China's major nonferrous metals and light metals industries are expected to expand to possibly 200,000 metric tons of copper, lead, zinc, and aluminum, which is a moderate production total by world standards. A few large copper centers might be developed and new aluminum-reduction plants built. Precious metals output will remain small. Export metals like tin, antimony, mercury, and bismuth will continue to be significant in world markets. The country will be able to make most of the high-purity metals it needs.

The cement industry might attain an output level of 20 million tons per annum sometime during 1970-75. Raw materials are no problem, and cement plants will be built according to markets and financial capability. Fertilizer production will rise markedly, with corresponding increases in pyrites and phosphates supplemented by imports of the latter. Based upon very extensive magnesite, refractories will be produced according to need. There will still be surpluses of fluorspar and talc. China will always be a large salt producer. Coinciding with the rise in industrial demand, production of asbestos and barite is also expected to increase greatly.

China's mineral industry is being built up to a new plateau of 50 to 100 percent greater than present size. This will be accompanied by more diversity and sophistication. Achievements will be notable, by developing-country standards, but the gap with industrialized countries will not necessarily be reduced. While China's economic influence is expected to rise, there is no evidence that it will be able to break into the inner circle of the five foremost industrial giants in the world during the next decade.

CHINA'S AGRICULTURE UNDER COMMUNISM

BY

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CHINA'S AGRICULTURE UNDER COMMUNISM

SUMMARY AND CONCLUSIONS

Mainland China, the third largest country in the world, supports almost one-fourth of the world's population with only 7.8 percent of the world's cultivated land. It is the second largest agricultural producing country in the world—following the United States with 1.9 acres per person to only 0.35 in China. The country, although able to produce virtually every kind of farm crop and animal, has a stagnating agriculture, which has undergone an almost complete change in all its institutional and cultural aspects. The large ratio of population to land forces the country to operate on a narrow margin of efficiency and gives little promise of a higher level of consumption without further heavy concentrations of production inputs.

Agriculture produces a large share of the national income; it provides a livelihood for about 80 percent of the population, is an important source of raw material for consumer goods industries and the sale abroad of its products provides the major portion of the country's foreign exchange earnings. Nevertheless, the investment allocations to agriculture were extremely limited according to its needs. The major portion of state investment funds were utilized for water conservancy projects, machine building and other capital construction in the agricultural sector thus leaving the construction of local projects, land and crop improvement, and other inputs to local financing which has been chronically limited throughout China's history. Increasing the area of cultivated land, which is between 11 and 12 percent of the entire area, has been neglected with the result that the amount of cultivated land per person has been declining during the major portion of Communist tenure.

The area which is China falls into two broad divisions, North and South China, whose physical and cultural characteristics vary sharply. The Tsinling Divide, following roughly the 34th parallel, forms a natural boundary between these areas. In the North are lime bearing loess soils of the uplands and plains of northern China, while the leached, acid soils are typical of the delta area of the south. The Divide also separates the cold, dry winter wheat regions of the north from the wet rice-growing regions of the south. Single cropping is customary north of the barrier, while up to 3 crops may be grown on the same field in the south. Cropping patterns are equally characteristic. Rice and sweet potatoes are southern crops, while millet and soybeans are found in the far north. Wheat, barley, corn koaliang (sorghum) and cotton occupy the intervening area. A large variety of other food and industrial crops also are grown. Animal industry is of first importance only in the northwestern areas where nomadic tending of animals is carried on. Hogs are raised in the settled areas where farm-

ers produce them for meat. Large farm animals, however, are utilized primarily for draft and transportation.

Expansion of the cultivated area has been difficult and expensive because of unfavorable soil, climate, and the ruggedness of the terrain in the western two-thirds of the country. This area, lacking precipitation, population, communications, and transportation, is isolated from the eastern third of the country which has about 95 percent of the population and the major part of the cultivated land which is intensively cultivated, particularly in the major river basins. Having had little success in expanding the cultivated area, the Communist regime turned its attention to more intensive cultivation of existing cultivated land through the development of major projects of irrigation and water conservancy, mechanization of field operations (particularly cultivation of crops in North China and mechanical irrigation in the rice areas of central, East and South China), production of chemical fertilizer, improvements in cultural practices, plant improvement, and control of diseases and insects. Success in these programs has been limited. About one-third of China's cultivated land is capable of being irrigated, but maintenance of existing irrigation and drainage systems is about all the regime can manage with available tools and manpower. Thus, the regime has turned to the peasant with various incentive programs in an effort to increase their output. But the incentive programs, mainly ideological in nature—culminating in the Socialist Education Movement—have not produced the desired results. In fact, the country is experiencing the negative results that have plagued all other Communist nations undertaking similar programs. Cadres at the basic or production team level have been replaced by less experienced ones, and those who have been replaced have had their authority seriously impaired.

Research is sapped by massive propaganda campaigns stressing innovations that appear promising but untested. Experimental plots, which receive the bulk of attention and inputs at the production team level, field selection of the larger ears of grain, balls of cotton from the prolific plants, and seeds from the best looking plants have resulted in little more than maintaining current yields. Furthermore, the effect of institutional factors on agriculture has been negative. Private plots, poultry and pigs are tolerated until such time as the collective sector can take them over. The pricing mechanism is manipulated to achieve the desired balance in farm production, but results have been indifference rather than a constructive attitude.

When the Communists come to power they faced the problem of organizing and directing a vast territory of contrasting cultures, people, economic conditions, and political attachments. They found a country ravaged by civil war with insufficient food and raw products, inadequate transportation and communication, an outmoded and weak industrial base, and a population weary and discontent from struggle and deprivation. To give direction to so complex an entity required first of all control of the prime moving factors including the vast countryside. The policy of the Communist regime has constantly been directed toward a fruition of that goal despite the numerous ramifications and retrenchment by the regime as conditions demanded.

Mao Tse-tung's approach to control was to enlist the peasant rather than the proletariat—as was done in other Communist countries.

Peasant support was gained through the process of an agrarian reform and the liquidation of the landlord as a class followed by a redistribution of the land. Then followed a series of organizational reforms beginning with the simplest form of social enterprise, the mutual aid team, and progressing through successive steps of so called producer cooperatives to complete collectivization of agriculture in 1957 (10 years ahead of the original schedule) in which the peasant lost title to his land and witnessed the fading of his dream as a landowner as he became a tenant for the state. A new structure encompassing collection, distribution, peasant services, sales and services, and other organs was established to provide the regime with the type and character of a centralized system necessary to maintain effective control. Thus the government was able to manipulate prices, establish incentive programs and institute other pressures as controls over production.

The transformation wrought by collectivization had a profound effect on China's agrarian society. Incentives were gravely affected resulting in indifference to common property. Peasants' lack of care for draught animals was reflected in a nationwide upsurge in the mortality rate of these animals. The rate of increase of agricultural production began slowing noticeably. The overall lack of technicians created imbalances in the established farming system; rotation of crops was greatly altered; incompetent but party loyal members became directors of collective farms; accountants could not solve the problem of distribution; and the numerous irregularities quenched the enthusiasm of the capable members.

Caught up in the overwhelming philosophical sweep of the Great Leap Forward, the demand was for an accelerated economic expansion, especially in agriculture. Bigness became the byword. To enable China to "walk on two legs" (develop industry and agriculture simultaneously) the labor force was mobilized to carry out a vast number of labor-intensive projects. To accomplish this, industry, agriculture, commerce, education (and the military) were organized into big communes which became the basic unit of society.

Under communal organization all vestiges of private property vanished from the countryside. As the collectives were merged, garden plots and livestock were confiscated, and in some instances even dwellings were taken over. The peasant was completely detached from his land and became an input of labor to be utilized where needed: in the field, digging canals, building dams, smelting iron, and building roads as local conditions and national objectives required. In effect all economic and administrative activities within a given area, the *hsiang* (roughly equivalent to a U.S. township), came under centralized authority.

The already relentless work pace was stepped up. Mao's "Eight-Point Charter" for agriculture, which included deep plowing, fertilizing, irrigation, close planting, pest control, field management, the use of improved seeds, and the use of improved implements, was put into effect, literally. During the slack season for farming, an estimated 40 percent of the rural work force was diverted from the fields to work on other projects, particularly the backyard smelting of iron. Harvesting losses were great because of the absence of workers at the critical time. Because of the apparent immediate success of the 1958 harvest,

plans for 1959 called for a reduced acreage of food crops in 1959. The unrealistic estimate by the Communist regime plus unfavorable weather during the next 3 years resulted in a near economic collapse.

Since 1955, collectivization, central planning, and the institutional direction of agriculture had been upsetting one of the most intricate traditional farming communities human history has ever known. The precarious balance which existed between agriculture and the population became worse; limited food became even more scarce; foreign trade patterns were drastically changed, and China became a net importer of food; severe rationing was imposed. Government retrenchment and concessions to the peasant were swift when the facts became known, but the action was too little and too late. Private plots were again offered the peasants and the free market reappeared. The entire structure of communal farming was changed drastically; the work team (20 to 30 families) became the basic accounting unit. Despite improvement in agricultural production since 1961, China's population does not enjoy even the level of consumption it did in 1958.

Results of the collective and communal system, mostly all bad, were numerous. Exploitation of the Chinese peasant in communes and other collective institutions led to severe deterioration in his means of production. Fertility levels of the better cropland declined. Draft animal power became critically short. Simple tools such as hoes, spades, sickles, plows, water wheels, and carts wore out faster than they could be replaced. Pig numbers declined sharply thus destroying a valuable source of natural fertilizer. Traditional rotations and complex interplanting systems were destroyed. Continuous cropping of cereals replaced pre-Communist farming systems; this led to problems with the soil, weeds, and insects. Double cropping and interplanting were put into practice in areas where they were not justified either by length of growing season or by precipitation levels. Numerous other inadequacies stemming from central direction (overorganization of labor, bureaucracy at headquarters, and inadequate communications) have weighted heavily against the success of institutional farming. Possibly most important of all, however, has been the development of apathy and indifference by the peasant without whose help the government's scheme for economic advancement cannot be successful.

Efforts by the government since the Great Leap Forward to revitalize the loyalty and industry of the peasants and to expand production of agriculture have attained only partial success. Substantial increases in investments in agriculture and aid provided by support industries which have aided in increasing machinery, tools, chemical fertilizer, insecticides, and irrigation machinery, have had a beneficial effect on agriculture, but have not been as effective as hoped by the regime. Production in the socialist sector which has benefited from the new policies has been disappointing and continues to decline per capita following a rather general per capita increase during most of the 1950 decade. On the other hand, production on private plots has increased sharply since their revival in 1961. The major increase in exports of agricultural commodities since 1962 has come from increased production of the private plots. Yet the socialist sector has been the recipient of government financed inputs.

The government has attempted, since overcoming much of the setback of the Great Leap Forward, to reassert much of its former control under the commune system and has, at the same time, tried to obtain a greater effort from the peasant in collective production. The results have correlated closely with the incentives and freedoms allowed the peasants. The greatest efforts by peasants have been in the activities which have produced the greatest profits: raising hogs, poultry and eggs, and in other sideline production and in the production of sugarcane where special bonuses were offered.

The approach to increasing production in the socialist sector has been to appeal to the peasants' socialist conscience: individual benefits will follow the success of society as a whole. The Socialist Education Movement of 1964 and 1965 and the Current Cultural Revolution have not lifted the peasant out of his state of resentment and apathy. His effort toward collective work appears to be no greater than the minimum necessary to insure a tolerable level of consumption from himself and family. Although this level has increased materially since the 1959-61 depression, it has not regained previous levels even counting the increased production from the private plots and the huge imports of grain. Nor does his future hold much promise. Population maintains an ever-increasing pressure on the land. Production of most crops appears to have reached the maximum level permitted by the present level of soil fertility. Production of chemical fertilizer, although increasing rapidly, still lags substantially behind requirements. Additions of more farmland through water conservancy projects is questionable except through huge capital outlays for reservoirs, long irrigation and drainage ditches, and expensive leveling operations. There is a shortage of well-trained individuals with scientific and technical competence to organize and direct technical improvement programs on a scale commensurate with China's needs. On top of this is the likely loss of a full year of schooling by upper high school and college students in 1966-67. When students return to school they face a modified curriculum of depleted scholastic courses. The policy of national self-reliance has a depressing effect on investment, and military production continues to sap resources.

Mainland China has entered its Third Five-Year Plan—3 years behind schedule—without defining the plan or stating its objectives. Instead official announcements referred vaguely to "implement more effectively the National Program for Agricultural Development"—a flashback to the original 12-year plan formulated in 1956 and subsequently abandoned. In the new plan agriculture retains top priority. However, inferences of increased construction of new enterprises and expanded production of raw materials suggests a stronger orientation to capital construction and an increase in the industrial base. The tone of the new plan is one of caution, and official estimates place the time for modernizing China's economy at least double the original 12-year plan—20 to 30 years or even longer.

For agriculture, prospects are, at best, for a slow, gradual increase assuming no major disruptions in China's political fabric. There are indications that Mao Tse-tung is attempting to revitalize the commune system and that he favors accelerating production programs reminiscent of the Great Leap Forward. The institution of either

of these programs would result in dislocations in agriculture resulting in lowered production. The "politics in command" philosophy of the Communist regime ignores the practical and economic problems of production in agriculture. Its application will vary depending on the outcome of the present Party struggle. Two years (1965 and 1966) of reduced food production likely have further reduced already limited stocks. A further decline in food production thus would place greater requirements on imports of grain, an action which could take a larger portion of earnings from foreign exchange. Remittances by overseas Chinese to relatives declined in 1966. The critical period for agriculture in 1967 is fast approaching. If the political unrest of the past few months continues into the cropping season, which is rapidly approaching, serious consequences could result in a serious decline in the agricultural sector.

THE AGRICULTURAL SETTING

The original aim of the Communist regime was to build a strong industrialized country modeled on the Soviet pattern. Although events since the completion of the First Five-Year Plan (1953-57) have modified the method and have drastically upset the original timetable, the ultimate aim remains the same.

An appraisal of developments in China's agriculture is limited not only by the paucity of available data but also because of a lack of reliability of even those data which are available. The degree of preciseness, thus, is limited to approximations. Despite the substantial increase in western travel into the Mainland, very little usable and reliable information has been forthcoming. Another limiting factor in such an appraisal is the lack of a complete and reliable body of data on the agricultural sector, particularly for production and consumption, for the period prior to the Communist's assumption of power. Despite somewhat successful but limited efforts by the Chinese Nationalists in developing a reporting system, no reliable index was developed whereby an accurate assessment could be made of pre-World War II or pre-Communist era data for the Mainland. The fragmentary and unreliable data issued since 1958 by the Communist regime makes an accurate evaluation of the agricultural economy of China a near impossibility.

Despite these limitations, however, some consistent generalizations and trends are quite apparent. These together with official statements made at critical times during the ups and downs of the stormy tenure of the Communist regime provide some guidelines for piecing together what is hoped to be a reasonably accurate general picture of the developments in agriculture on the Mainland of China under the Communist regime.

This study explores the factors underlying the development of agriculture in the Chinese Communist mold and analyzes these developments within the framework of Communist policy with respect to allocation of resources, central planning, and control over production and distribution. The effect of these developments will be related to food requirements and availabilities, trends in agricultural production, economic stability, domestic policy, and foreign trade in agricultural commodities.

After 17 years of Communist rule, the economy of Mainland China—of which agriculture is the foundation according to Mao Tse-tung—does not yet provide a tolerable living standard for the exploding population, let alone the margin necessary for sustained growth. Moreover, while the decay of the social revolution appears to have been arrested and a degree of support gained by skillfully blending ideology with nationalism, the two critical groups that must underwrite the programs of agricultural growth and modernization—the peasants and intellectuals—still show little respect for the Communist Party or faith in Party doctrine.

AGRICULTURE IN THE ECONOMY

Mainland China, the world's third largest country (slightly smaller than Canada) is the world's second largest agricultural producing country (following the United States). With only 7.8 percent of the world's cultivated area, however, it supports almost one-fourth of the world's population. This unfavorable population-land balance, which provides less than 0.4 of an acre of cultivated land per person, has been a major deterrent to the country's economic progress. Between 80 and 85 percent of the population is engaged in farming, and agriculture currently supplies between one-third and one-half of the national income. Agriculture also supplies the bulk of the raw materials base; farm products and finished manufactures made of agricultural raw materials constitute 60–70 percent of total exports.

Despite China's ability to produce virtually every kind of farm crop and animals to some extent, the country's agriculture is in a stagnant state. During the first decade of Communist rule, the government claimed a small surplus, but beginning in 1961 the country became a net importer of agricultural raw products, consisting primarily of grains. In 1966, however, agricultural exports exceeded agricultural imports. These imports which consist mostly of wheat provided about 5 percent of the caloric intake from grain (excluding potatoes)¹ in 1964. These imports have trended upward during the last few years despite a substantial increase in the production of grains since the food crisis of 1959–61. Whereas exports of agricultural commodities provided substantial amounts of foreign exchange, it is estimated that since 1960 from 35 to 45 percent of the country's foreign exchange has been utilized annually to pay for grain imports.

Boom to Bust

During the first decade of Communist rule substantial gains were made toward fulfilling the Communist model without materially affecting the productive powers of agriculture.² Despite the imposition of the collectivization model of the Soviets, which came late in the 1950 decade, a sufficiently reasonable balance was maintained with respect to soil fertility, traditional farming methods, farming implements, and draft power, and peasant incentive (although this had been waning since the start of collectivization in 1955) to register overall gains in agricultural production almost each year. Substantial gains were

¹ Potatoes are included in Chinese grain statistics on a ratio of 1 unit to 4 units of potatoes.

² This does not imply that a healthy agriculture existed in China during this time. Recorded history is replete with unfavorable balances between population and agricultural resources in China. Following the Great Leap Forward this balanced worsened.

made in foreign trade, with exports of agricultural products reaching an alltime high—but at the expense of consumption.

Central planning, the core of Communist control of production and utilization, which ignored traditional cultures of farming, badly upset one of the most intricate farming systems known in history and consequently disrupted the delicate balance between the population and agricultural resources. Unfavorable weather during 1959–61 helped to bring about a drop in farm output to a dangerously low level. Together with dislocations in other sectors this resulted in a near collapse of the economy, slowed down the industrialization effort, greatly reduced the foreign trade turnover, and radically altered the pattern of foreign trade with the Communist bloc and with the Free World.

The Long Road Back

Following 2 years of devastating reverses in agriculture the Communist regime—too late to stave off a third successive bad year (1961)—adopted a new economic policy in early 1961 of “agriculture as the foundation and industry as the leading factor of the economy.” This orientation was designed to generate a quick recovery of agriculture so that the long range program of industrializing the country could be resumed. The results so far have been a sluggish upturn, but not a recovery of the economy. First indications of improved conditions appeared in the latter part of 1961. Three years later, in 1964, the official description was of “adjustment” and “balancing” compared with “recuperation” in 1963.

According to various official reports, industry has advanced more rapidly than agriculture since 1963, nevertheless a large portion of its capacity remains unused. Despite the regime’s announced policy of agricultural priorities, heavy industry has registered the highest gains. Increases in agricultural raw materials, some through importation such as cotton, tobacco, and wool have not only bolstered light industry but have stimulated higher economic activity. Gains in numerous industries designated to support agriculture have occurred but not in the magnitude claimed.

Although there is evidence to support official claims that the current level of consumption exceeds that of the 1959–61 period, agricultural production in the socialist sector has failed to register a net per capita gain. Large imports of grain and substantial increases in production on private plots account for most of the increase in consumption since 1961. Production of food crops on socialized farms failed in 1966 for the eighth straight year to keep pace with the population. Analyses of other major crops show an even more dramatic variance. Acreages of many important industrial crops were modified after 1959 to provide larger areas for food crops; these acreages have not been completely restored nor have yields increased in proportion commensurate with increases in the application of chemical and natural fertilizers. It is estimated that production of cotton in 1966 was less than the 1957–59 average due to smaller acreage and a lack of substantial increases in yields. Soybeans appear to have fared even worse. Decline in acreage since the 1959–61 crisis has more than offset the increase in yields. One exception is sugarcane production which has increased rapidly in recent years under a special incentive program.

The livestock sector has made fairly steady gains, but some categories, particularly large animals and draft animals have not fully recovered from the setback of the Great Leap Forward. Although exports of agricultural commodities have increased significantly since 1962, they do not appear to have reached the 1959 level. Thus, almost a decade after the Great Leap Forward, which was to solve China's economic problems in a few years, China's agriculture was still in a state of stagnation. As one authority observed: "In short, it may turn out that this great leap will have cost the Chinese economy roughly a decade of growth."³

FACTORS AFFECTING AGRICULTURE

Limitations Imposed by Nature and the Communist Pattern

Location.—China, which occupies the central portion of the Eurasian continent has a similar latitudinal position to that of the United States. If China were superimposed on North America it would reach from the Atlantic to the Pacific. The eastern half would fill the Gulf of Mexico and extend from Puerto Rico to the Hudson Bay; the western half would conform closely to the western portion of the United States.^{4, 5} In terms of climate and thus in natural vegetation and soils, eastern China and the eastern part of the United States have many similarities. Another common factor in their location is the vulnerability of similar areas to devastating tropical storms. The central area of both countries lies to the leeward of great continents in the battleground of polar and tropical airmasses. A major difference is that China extends westward and ends in the dry middle latitude climate of arid central Asia and thus loses the advantages of the oceanic effects of a west coast. Moreover, China has much less level land than the United States, especially in the west and south. About one-half of China's surface exceeds 1 mile in elevation. The more important agriculture zones in China which also are the most populous are somewhat further south than the most populous parts (industrial areas) of the United States. The ruggedness of the terrain and the inhospitable character of the climate along most of China's interior boundaries have impeded travel.⁶

Land.—China's land surface exceeds that of the continental United States (49 States—excludes Hawaii) by 4.2 percent but the United States has roughly 36 percent more cultivated land, amounting to five times as much cultivated land per person as China (1.9 acres per person in the United States to 0.35 acre in China).^{7, 8} Only about 11 percent of

³ Alexander Eckstein, *Communist China's Economic Growth and Foreign Trade*, McGraw-Hill, New York, 1966, p. 244.

⁴ Many of China's major cities have a common location with those in the United States. Hong Kong and Canton are within the tropics in the latitude of Havana; Shanghai would be about 200 miles east of Jacksonville, Fla., while Chungking, capital of Szechwan Province would be near Galveston, Tex.; Peking and Tientsin are in the latitude (but west) of Washington, D.C.; Mukden matches Albany, N.Y., and Harbin parallels Montreal, Canada; Urumchi, capital of Sinkiang Province, would be in the vicinity of Jackson Hole, Wyo.; and Gartok in Tibet would be at Los Angeles, Calif.

⁵ Edgar Snow, *The Other Side of the River*, Random House, New York, 1961, p. 767, George B. Cressey, *Asia's Lands and Peoples*, McGraw-Hill, New York, 1951, p. 52.

⁶ Theodore Shabad, *China's Changing Map*, Frederick Praeger, New York, 1956, pp. 1-6.

⁷ Cultivated land in China is defined as land given to the cultivation of various agricultural crops needing constant plowing the year around. It includes developed land, new reclaimed wasteland, land left uncultivated for less than 3 years in succession, and land left uncultivated for current year (rotated fallow land). This definition is somewhat comparable to the U.S. definition of cultivated land.

⁸ American Consulate General, Hong Kong, *Current Background*, No. 434, Jan. 15, 1957, p. 7.

the total land area of China is utilized in production. The practice of double cropping in China, however, provides a sown area about 50 percent larger than the cultivated land area, thus slightly exceeding the sown area in the United States. Official statistics show that since 1957 there has been a significant decrease in the cultivated area, from 276.3 million acres in 1957 to about 263.4 million acres in 1964.

Numerous factors account for this change—none of which can be weighted with any degree of accuracy. The upheaval of the Great Leap Forward probably accounts for most of the decline. During this unsettled period, productive land boundaries were changed, much cultivated land was utilized in the overambitious water conservancy projects, industrial sites (many of which were not utilized immediately) cut into areas of rich farmland, and roads and other improvements resulted in the transfer of cultivated land. Problems of salinity occurred in irrigated farming areas and along the coast during subsequent periods of inadequate rainfall. Much of the loss of cropland can be attributed to poor management practices.

Except for the large drop in 1958, as indicated by official statistics, the decline in cultivated land was gradual. The extent of the decline, its continuance or an upward trend are difficult to assess. Official reports, since 1962 when it appeared that the decline may have been arrested, have referred to the cultivated area only as 1.6 billion mou.^{9, 10} In a recent report, however, it was pointed out that . . . owing to drought, water-logging, wind and sand storm, the quality of soil which is "acid in the south and alkaline in the north," and plant diseases and pests, frequently crop yield is obtained from only 1.2 to 1.3 billion mou (198–215 million acres) or less. . . . The principal low-yield areas . . . affected by drought, water-logging and alkali (are) on the Yellow River and Huai River plains; areas seriously affected by drought and soil eroding (are) on the loess plateau and along both banks of the Yellow River in the middle reaches; and low-yield areas (the soil is alkaline in most cases) (are) in subtropical areas and hillock areas south of the Yangtze River. These low-yield land areas total . . . 400–500 million mou (66–82 million acres). The report concludes that to "transform these vast tracts of low-yield land with more, faster, better and more economical results is an important scientific and technological problem of modern times."¹¹

A recent official report stated that within 20 or 30 years cultivated land still will average only 0.33 to 0.5 acre per capita because of population increase.¹² The gradual decline in the per capita area of land for producing crops points out the pressing need, as recognized by the Government, of intensifying the use of available cultivated land while reclaiming new land at a rapid pace. Both objectives are extremely difficult to achieve because of a critical shortage of inputs.

The problem of reclaiming new land is further complicated by the choices now existing. Available land in the eastern third of the country, which has about 95 percent of the country's population, is either marshy or saline with corresponding tendencies toward excessive

⁹ One mou equals 0.165 acre. This rounded figure (ranging from 1.55 to 1.65 billion mou) includes a maximum of over 16 million acres which could be affected and not reported.

¹⁰ American Consulate General, Hong Kong, *Selections from China Mainland Magazines*, No. 368, June 10, 1963, p. 5.

¹¹ *Ibid.*

¹² *Ibid.*

acidity in the south and alkalinity in the north. Although these conditions may be overcome, at substantial cost, further expansion would have to occur in the western two-thirds of the country which is mountainous, has comparatively low soil fertility, inadequate precipitation, unfavorable temperatures and an almost complete lack of transportation and communication. The most promising means of increasing production, therefore, and the one adopted by the Communist regime—although not to the exclusion of reclaiming new land—has been the intensification of cultivation of available land. Measures have included a greatly expanded use of the off-season labor force in developing irrigation, flood control, and other water conservancy projects, a substantial increase in the production and application of chemical fertilizers and insecticides, greater emphasis on raising livestock, and a broader application of technical innovations.¹³

Soils.—The long-held belief by the Chinese farmer, that the soil is a medium or vehicle which provides a place for plants to grow and provide a feeding place of plants rather than itself the source of plant food, has been a major factor in preserving the fertility of the soil. For generations the Chinese farmer's achievements on his ancient, hungry soils amply attested his skill of husbandry, as the pre-World War II yields per acre of major crops compared well with world averages.¹⁴ The delicate balance which has existed between China's soils and population, however, was strained under the weight of subsequent Government policies which provided the soil too little in requisites while requiring an increasing contribution from the soil to support other sectors of the economy. Furthermore, population pressure forced the use of poor and marginal land, which, combined with low labor productivity, has produced disappointing results.

As population continued to increase and as cropping patterns were modified by the Communists, yields of most food crops became static despite the apparent use of all available natural and chemical fertilizers. Prior to 1949 production and imports of chemical fertilizers were negligible compared with requirements. An editorial in the *People's Daily* (Jen-min Jih-pao) for October 1959 stated that of the cultivated land in China, about 31 percent was classified as fertile, 40 percent as ordinary and 29 percent as low yielding. Elsewhere it was noted that almost one-half the farmland was in hilly or mountainous regions that were not suitable for significant improvement by means of conventional irrigation programs.

China's infinite complexity of soils is largely a byproduct of the action of climate and vegetation on a wide variety of parent materials. Despite multiple classifications, however, the numerous classes of soils can be divided into two great groups, which result from and, in turn, conform to the major physical contrasts existing between the northern and southern halves of the country with respect to agricultural, climatic and cultural differences. The north-south dividing line is the Tsinling mountain system which extends roughly along the 34th parallel from the southern part of Kansu and Shensi Provinces through southwestern Honan and northwestern Hupeh eastward into Anhwei Province. This mountain range, which varies in

¹³ T. J. Hughes and D.E.T. Luard, *The Economic Development of Communist China, 1949-1960*, Second Edition, Oxford University Press, London, 1961, p. 3.

¹⁴ Committee on Agricultural Engineering, *A Report on Agriculture and Agricultural Engineering in China, 1949*, Chicago, Ill., June 1, 1949, p. 237.

elevation and decreases from west to east, has climatic as well as soil differentiation significance.

In the north where rainfall is limited and the natural vegetation is grass, soils tend to be rich in lime and soluble plant nutrients, porous and friable, and easily penetrated by water. Because of limited rainfall and cooler temperatures, little leaching occurs, but there is a tendency toward alkalinity and salinity, especially in areas where surface irrigation is practical. These high calcium type soils (called pedocals) include chernozems, chestnut brown and light colored desert soils. Lowland soils include Shachiang¹⁵ and saline soils. Saline soils occur mainly in the Yellow River Plain, in the Western Manchurian Plain and throughout Tibet and Sinkiang. Shachiang soils are found in the lowland in Shantung, Honah, Anhwei, and Hopeh Provinces.

The non-lime-forming soils (called pedalfer) south of the Tsinling mountains, unlike their northern counterparts, are generally acid and are leached due to heavy rainfall and high temperatures. Upland soils include podzal and podzolic soils, and red and yellow soils. In the lowlands where drainage is poor various rice paddy soils are formed. Some alluvium forms also occur. These are ideally suited for rice cultivation. Periodic flooding of the rice fields has developed an artificial clay pan which has become a major factor in keeping paddy fields flooded.

China's soils have lost much of their initial fertility through long periods of intensive use and the adverse effect of nature. There is an almost universal deficiency of nitrogen. The replacement of phosphorus and potash requires fertilizers which generally have not been available to the impoverished farmer. The low content of organic matter in the soils reduces their water-holding capacity and resistance to erosion. The magnitude of these deficiencies is demonstrated by the vigorous efforts by the Government to encourage peasants to increase the production of livestock, especially hogs, for their manure; but these efforts, including the application of night soil and other organic matter, are not sufficient to replenish the loss of organic material through the habitual use by the peasants of plant stalks, roots, and leaves for livestock feed and for fuel.

Climate.—Mainland China's productive land area is greatly affected by climate. The country's climate is dominated by airmass movements which are defined as the winter and summer monsoons. This monsoonal action provides the country with a climate that is alternately continental and dry in winter and maritime and wet in summer. Superimposed on this seasonal to and fro circulation are smaller airmass movements such as cyclonic storms and typhoons. The varied topography adds further to the complexities of the weather. Thus, precipitation varies widely from region to region, from year to year, and from season to season. One-fourth of the land, largely in the north and the east, receives less than 12 inches of rainfall annually and either is entirely unfit for agriculture or is usable only under special conditions of dry farming or irrigation. South of the Tsinling divide and the Hwai Ho Valley annual rainfall is abundant (40 to 80 inches) and in general is adequate throughout the year. North of

¹⁵ These soils are formed in flat areas where frequent flooding and poor drainage allow the formation of tight clays. When wet, they are heavy and sticky and when dry they become so hard that plowing may be impossible.

the divide precipitation diminishes rapidly; it is only 25 inches in the North China plain and Manchuria and less than 4 inches in the Mongolian desert plateau and the Tarim Basin in Sinkiang Province. Most of the precipitation in the north falls during the summer. About 75 percent of the water resources are in the south, which has only 38 percent of the cultivated land.¹⁶

China's latitudinal position and the wide topographical variations provide the country with a broad assortment of temperature patterns. In many regions of the country temperature is a major limiting factor in developing agriculture. All of China can be hot in summer. Temperatures of 95° F. and above have been registered from the southern coast to as far north as Harbin in Heilungkiang Province. Harbin also has registered a -40° F. in winter. Variations in temperature diminish from north to south. In tropical Hainan Island, for example, the average annual temperature range varies only about 15° compared with over 80° in northern Manchuria.¹⁷ The winter isotherms (lines of equal temperature) are alined from east to west and fairly evenly spaced. Winters in China are more rigorous latitude by latitude than in the United States. On the other hand, July temperatures in China are remarkably uniform; the isotherms trend north and south and are widely spaced.¹⁸

In general, rainfall occurs during the period when temperatures favor growth. In the extreme south agriculture may be continuous with as many as three crops per year. In the central area, there is time for one crop during the summer months, but winter crops are feasible. Farther north cultivation is limited to one harvest during the short summer. Frost-free periods range from 365 days in southern Kwangtung Province, to about 250 days in the Yangtze Valley and 300 days in Schechwan Province, to 225 days between the 30th and 40th parallels in the area of the North China plain and diminishes to about 100 days in northern Manchuria. In the west, high elevations lower the temperature and may even preclude the growing of crops.²⁰

BALANCING POPULATION WITH RESOURCES

Of the factors affecting the development of Mainland China's economy, population is the most important. People, according to Communist leaders, were China's greatest asset at the inauguration of the Great Leap Forward in 1958. This appraisal stems from Chinese Marxist's doctrine that under socialism, with the means of production in the hands of the representatives of the masses, the benefits of economic development are returned to the workers, who are the source of all wealth, and that an increase in population means an increase in the ranks of the working classes, which leads to an increase in production sufficient to meet the needs of an increased population and to afford a rising living standard as well.²¹ Early Chinese Communist theorizing decried all forms of population control as unnecessary for China

¹⁶ *Water Conservancy and Electric Power*, Peking, No. 4, February 20, 1959.

¹⁷ Theodore Shabad, *op. cit.*, p. 15.

¹⁸ The isotherm of 82° F. parallels the coast and encloses much of agricultural China.¹⁹

¹⁹ George B. Cressey, *Land of the Five Hundred Million*, McGraw-Hill, New York, 1955, p. 69.

²⁰ *Ibid.*, p. 70.

²¹ John S. Aird, *The Size, Composition and Growth of the Population in Mainland China*, (International Population Statistics Reports, Series p. 90, No. 15, U.S. Bureau of the Census), U.S. Government Printing Office, Washington, D.C., 1961, p. 7

and a device of decadent capitalism. The *People's Daily* of April 25, 1952, condemned birth control as being simply "a means of killing the Chinese people without shedding blood."

However, as the Communist leaders have so painfully discovered, the fundamental fact of life in their land is the existence of a growing population and a comparatively small and technically backward agricultural base. The Communist regime introduced population control programs during 1954-58 but with little success despite their intensity.^{22, 23}

The more recent approach to population control ties family planning into the sphere of national planning but approaches the value of the individual to the state differently. The new reasoning follows the line that with later marriages and spacing births (by various means to the last resort of voluntary sterilizing by either partner) parents may devote more time and attention to their children's education as well as better fulfilling their task in the building of socialism. Stress is on the quality of the new generation, not quantity.

The 1950 marriage law set the minimum age for marriage at 20 for men and 18 for women, but in 1962 doctors and counselors were advising ages not less than 25 and preferably between 28 and 32 for men and from 22 to 26 for women, "or a little later."²⁴ Information from various areas in China indicate the authorities have devised various methods of influencing the size of families including the limitation or denial of maternity supplies and denial of food rations for new members of the family beyond a prescribed number.^{25, 26} In certain areas peasants were informed that the size of private plots could no longer be enlarged to accommodate more than the stipulated family size.

The regime is attempting to effect a program that will result in a population slowdown similar to that in Japan but without the excesses in implementation. According to estimates of population by the Census Bureau²⁷ the critical years for agriculture (1959-61) following the Great Leap Forward had a significant effect on controlling population growth; but with an improvement in food availability population growth resumed at an even faster rate. In 1964, Premier Chou En-lai stated that the Chinese rate of increase in population had "gone up again to 2.5 percent". He also stated that the present target was to lower the birth rate to below 2 percent, but he did not believe the Chinese could rival the Japanese rate "before 1970".^{28, 29} The official population figure now is 700 million. At a rate of increase of 2 to 2.5 percent, 14 to 17.5 million persons per year

²² So intense was the birth control campaign in the early part of 1958 that in some places the party faithful were pledging themselves not to have a child during the Second Five-Year Plan (1958-62).

²³ Jen-Min Jih-pao (*People's Daily*) Peking, April 25, 1952.

²⁴ Kung-Jen Jih-pao (*Daily Worker*), Peking, June 28, 1962.

²⁵ One report indicated that in Shensi Province the limit was 2 children and in Manchuria it was 4. Additional children would not be granted rations and the special maternity supplies would be denied the mother.

²⁶ Chen Chan, Feature Article No. 60, "China Stages Massive Birth Control Campaign, Feb. 20, 1964.

²⁷ Foreign Demographic Analysis Division, U.S. Bureau of the Census *Estimates and Projections of the Population of the NATO and the Communist Countries, Selected Years, 1938-1980*, March 1964.

²⁸ Considering the low birth rate in Japan (about 0.9 of 1 percent), it is doubtful if this rate can be attained long after 1970 because of the rural nature of the population and the religious and traditional philosophy of the blessings of a large Chinese family.

²⁹ *The Washington Post*, Feb. 3, 1964, p. A-12. Interview granted Edgar Snow by Premier Chou En-lai in Conakry, Guinea, Jan. 23, 1964.

would be added to China's population. There is considerable agreement among Western demographers that China's population exceeded 750 million during 1965.

ESTABLISHMENT OF THE SOCIALIST STRUCTURE

The uniqueness of the socialist structure in Mainland China is that it is a product of Mao Tse-tung's version of revolution in which the rural masses were the instrument of revolution instead of the Moscow-Leninist formula of the urban proletariat. The socialist structure was established by producers cooperatives.³⁰ The third stage was full collectivization, and the fourth, the establishment of communes.

The aim of the Communist Chinese regime was to transfer China's most important capital producing sector, agriculture, from a system of private ownership and individual enterprise to one of public ownership, similar to other nationalized industries. The regime sought to provide the urban and industrial population with agricultural commodities at relatively low prices, to utilize rural labor more efficiently and to increase agricultural productivity by applying the methods of large-scale production with a limited amount of capital. In three successive steps, the regime thus effected unprecedented changes in China's countryside: The land reform, 1949-52; collectivization, 1953-57; and communes, 1958-60. Significant subsequent changes occurred in the structure of the commune. The current socialist farming unit—representing, at best, a Government salvage of little more than the original working group—is a mutation whose course cannot presently be chartered.

Land Reform

The avowed purpose of the Communist regime in effecting land reform (1950-53) was to gain the support of the largest segment of the population. This political maneuver was accomplished on the pretext that ownership of land in Mainland China, to a high degree, was vested in the landlord class and that this condition was responsible for underdevelopment in agriculture. Although some basis existed for these claims they were overexaggerated.

China's traditional system of land inheritance—whereby land was subdivided among the various heirs instead of the primogeniture system—prevented large accumulation of land in the hands of a few and resulted in numerous small fragmented noncontiguous as well as uneconomical plots which were heavily in debt. Furthermore, the size of the average farm was barely large enough to support its occupants. The claim by Mao Tse-tung therefore, that between 70 and 80 percent of China's farmland was owned by approximately 8 percent of the farm population—consisting mostly of landlords and rich peasants—was politically oriented rather than factual.³¹

Ownership of land prior to the Communist takeover was not clearly categorized. There are evidences that so-called landlords probably controlled less than one-third of the land and that their holdings to-

³⁰ These so called cooperatives bear no resemblance to Western cooperatives, and they lack the characteristic of voluntary association which is the trade mark of U.S. cooperatives. The use of the term "cooperative" by the Communists has a traditional significance.

³¹ Ygael Gluckstein, *Mao's China*, The Beacon Press, Boston, 1957, p. 79.

gether with those of rich peasants probably amounted to little more than half the cultivated land.³² Middle peasants (owner-operators hiring 25 percent of the labor) and poor peasants owned the remainder of the land.

Land reform was accomplished in three stages. In the first stage the regime reduced rents by 25 percent, lowered the rent ceiling (to 37.5 percent of the offtake), prohibited advance payment of rents, refunded prepaid rent, and canceled unpaid rents. So-called "positive elements" (politically reliable poor peasants) were organized to carry out the second stage which was to "struggle" against the landlords on the basis of class differentiation. The end result was the confiscation and appropriation of property earmarked for redistribution. The final stage included classification of property and its distribution.

The amount of land transferred through land reform amounted on the average to about one-third of an acre per person (about 115 million acres distributed among more than 300 million peasants) according to official information. Almost 3 million head of draft animals (mostly water buffalo and oxen) were distributed. The net accrual of productive forces by the peasants was hopelessly inadequate, but the Communist regime gained its objectives of gaining the support of a large mass of new landowners, eliminating the landlord class and shackling the rich peasants without alienating the large group of middle peasants, which the regime counted on heavily to maintain a high level of agricultural production.

The redistribution of land, although a major aim, was secondary to the "class struggle" but, land reform did not free the productive forces from limitations peculiar to small-scale farming. In fact, further fragmentation of farms occurred when the regime allowed equal shares of land to be allotted to families of state personnel, armed forces and other forward groups. Furthermore, the eradication and suppression of the landlord and rich peasant classes, respectively which traditionally were the main sources of rural credit, resulted in a deterioration of the rural economy after the windfall to the peasants was spent.

Mao Tse-tung concluded in 1953 that after 3 years of land reform some 60 to 70 percent of the rural population was still poor or still not well off. "People are still in a state of poverty, because they lack the means of production. Many have gone into debt. Others have sold or rented their land."³⁴

An official survey in 1954³⁵ revealed that poor peasants and farm laborers constituted 29 percent; middle peasants 62.5 percent; rich peasants, 2.1 percent; and former landlords 2.5 percent of the total number of households and that 4.2 percent had been incorporated into

³² The answer to the percent of land owned by landlords is not only in the official definition of "landlord" but an individual interpretation. Communist estimates prior to 1950 showed that landlords owned 26-43 percent of the cultivated land. Non-Communist analysts show landlords owning less than 30 percent. These figures are far below those quoted by Mao Tse-tung. The land held by both landlords and rich peasants according to these studies ranged from 80 percent being held by 30 percent of the population to 53 percent being held by 10 percent of the population. Data available from non-Communist analysts agree more nearly with the latter figures.³³

³³ *Ibid.*, pp. 79-81.

³⁴ Mao Tse-tung, *On the Question of Agricultural Cooperatives*, *Peoples China*, No. 22, Peking, Nov. 1, 1955, pp. 3-17.

³⁵ Cheng Chu-yuan, *Communist China's Economy, 1949-62*, Seaton Hall University Press, 1963, p. 28.

one of the lower stages of collective farms. The survey revealed that on the average each poor peasant household had 1.8 acres of arable land and that there was one draft animal for every 2 households, one plow for every 3 households and one water wheel for 17 households. The rich peasant households, on the other hand, averaged 5.8 acres of arable land, 2 draft animals and one plow and there was a water wheel for every 3 households.

Many poor and lower level middle peasants, unable to successfully operate their farms, sold or rented them to the higher level middle and rich peasants and became laborers. The extent of this shift is not known, but in some areas land changed hands at an increasing rate between 1951 and 1953.³⁶ In many areas of the country a new rich peasant class, comprising a large number of rural party cadres, began to emerge.³⁷

Collectivization of Agriculture

Originally socialization of agriculture was to be accomplished in three stages with completion roughly coinciding with the end of the Third Five-Year Plan, i.e., by the end of 1967.^{38, 39} The announcement of the First Five-Year Plan (1953-57), with its emphasis on the development of industry, gave the general impression that the agricultural phase of the revolution was over and that the new era would spawn the expected industrial empire.

However, collectivization was spurred by the threatened rapid rise of a new class of rich peasants—an ideologically intolerable situation—following the land reform. The atmosphere of “spontaneous tendency toward capitalism” among the new peasant landowners had been increasing from the earliest period of land reform under the Communist regime, even during the civil war. For these and a combination of other reasons the regime moved ahead swiftly with its program of consolidation.

Mutual-Aid Teams.—Mutual-aid teams, familiar throughout the country and already established in northern and western China before the establishment of the Peking regime, was used by the regime as a preliminary step in the socialization process. Organized concomitantly with the land reform program, the simplest form of these teams, comprising up to five households and known as temporary teams, was formed to compensate for shortages of manpower, draft animals and farm implements during rush seasons, mainly at planting and harvest time. Compensation (cash or in kind) was made on the basis of work and materials contributed but each household engaged in its own production, and the team was dissolved at the completion of specific tasks.

More advanced types of mutual-aid teams, comprising six to 10 or more households, were formed on a more permanent basis and generally functioned continuously. Although ownership of property was still in private hands some teams held some property (tools, animals)

³⁶ Tso Mu, *The Problem of the Separation of Our Peasants into Classes During the Historical Period After the Land Reform*, Kuang-min Jih-pao, Peking, May 29, 1961.

³⁷ *People's Daily*, Peking, Jan. 8, 1952.

³⁸ Half the peasant population was to be semisocialized (low-level collectives) during the First Five-Year Plan and the remainder during 1958-60. The final stage of socialism in which all private ownership would be abolished was to be accomplished by the end of 1967.⁴⁰

³⁹ Robert Guillain, *600 Million Chinese* (translated by Mervyn Saville, Criterion Books, New York), 1957, pp. 186-7.

⁴⁰ *Ibid.*

in common and combined efforts in farm production and subsidiary occupations on a year-round basis. Members were compensated according to their contribution and if they wished to withdraw were allowed to do so and take with them their share of land and other property. A system of accounting was organized around the "work-day" to provide equitable compensation for work.⁴¹ The necessity to pool resources and the desire by the Government to establish "the seeds of socialism" through mutual aid resulted in a rapid expansion of the teams. In 1952 over 40 percent of the peasant households were members of teams. This proportion had increased to over 58 percent in 1954 comprising almost 10 million teams. (See table 1.) After 1954, attention was confined mainly to the consolidation of existing teams into so-called agricultural producers cooperatives (APC's) and in organizing APC's directly from the peasant masses.

APC's.—The formation of APC's comprising 30 to 40 households, evolved through the consolidation of permanent mutual-aid teams. Although land was owned privately it was pooled for cultivation on the basis of annual plans prepared by central management. Compensation to members was based on labor and the contribution of land and other capital. This stage of socialization, which was to include only half the peasant households at the end of the First Five-Year Plan (1957), received an unprecedented organizational boost by top-party officials in 1955. From an experimental beginning with only 19 APC's in 1950, the number increased to 633,000 by the end of 1955, with nearly 80 percent of them being organized during the second half of that year.⁴²

This organizational spree continued into 1956 but the number of lower stage APC's organized during that year is unknown. Attention was turned to consolidating lower stage APC's into higher stage APC's or collective farms. By the end of 1956, however, almost 682,000 lower stage APC's were registered, with upward of 120 million peasant families, comprising over 96 percent of the rural families.⁴³ This rapid increase followed the adoption of a hard-line policy by Mao Tse-tung following a tour of rural China in the first half of 1955 where—according to his findings—there were the "emergence of new rich peasants . . . everywhere . . . Many poor peasants remain in poverty, some of them having contracted debts."

Collective Farms.—Following Mao Tse-tung's insistence to secretaries of provincial, municipal, and area party committees at a special meeting on July 31, 1955, there was an upsurge in the socialization of agriculture which carried far beyond any goals previously set for the collectivization of that sector. In less than a year, by June 1956, 110 million peasant families (92 percent of the country's total) had been affected. Lower stage APC's were consolidated into higher stage APC's—some by a mere paper transaction—and many newly organized lower stage APC's found themselves immediately consolidated into collective farms, which were Peking's version of the Soviet kolkhoz.⁴⁴ Although the major drives occurred during the off season, there was considerable disruption of the cropping patterns and activi-

⁴¹ Hughes and Luard, *op. cit.*, p. 149.

⁴² State Statistical Bureau, *Ten Great Years*, Peking, Foreign Language Press, 1960, p. 28.

⁴³ *Ibid.*

⁴⁴ Cheng Chu-yuan, *op. cit.*, pp. 30-34.

ties. Wholesale slaughter of livestock occurred, particularly of hogs, as peasants chose this form of disposition to that of assigning them to collectives.

The tempo of collectivization slackened somewhat during 1957. By the year's end, however, the number of collectives had more than doubled, amounting to over 700,000, comprising almost 90 percent of the peasant households. By the time communes were introduced in mid-1958 an additional 40,000 to 50,000 households had been collectivized.

TABLE 1.—*The socialization of agriculture in Mainland China.*

Year	Mutual-aid teams (1,000 units)	Lower stage APC's	Higher stage APC's
1950.....	2,700	19	1
1951.....	4,760	300	(1)
1952.....	8,030	3,640	10
1953.....	7,450	15,000	15
1954.....	9,930	114,000	201
1955.....	7,150	633,000	529
1956.....	(1)	681,697	311,935
1957.....	(1)	(1)	700,000
1958.....	(2)	(2)	740,000

¹ Not available.

² None.

Source: Henry J. Lethbridge, *The Peasant and the Communes*, The Green Pagoda Press Ltd. Hong Kong; p. 189.

Collective farms practically eliminated private property. Remuneration was no longer based on land which became the property of the collective along with many personal possessions including draft animals and large tools for which compensation was to be made over a 3- to 5-year period. A plot of land (not exceeding 5 percent of the average land per capita in the collective) and small tools were to remain private property. Peasants were allowed to raise livestock and vegetables on their plots and to sell the produce in free markets. Manpower was organized into permanent field production brigades on the basis of production specialities in the collective. Each brigade averaged about 20 households, although wide variations occurred depending on the degree of diversification within the collective. In some instances brigades were subdivided into work teams. The principle of "from each according to his ability, to each according to his work" was the guiding principle. Distribution of income after satisfying state and collective requirements was accomplished on that basis.

Communes

In mid-1956 officials favored scaling the larger collectives down to manageable size; in September 1957 the Party Central Committee ordered that collectives be reduced to an average of 100 households and be stabilized at that size for at least 10 years.⁴⁵ In light of this directive and the apparent successes of the socialization drive and an expanding agricultural production, there seemed little need for further change, especially to something so new and unprecedented as the communal society. However, the economy was not expanding rapidly

⁴⁵ American Consulate General, Hong Kong, *Survey of Mainland China Press*, No. 1618, Sept. 21, 1957.

enough⁴⁶ particularly agriculture. China's population problem was worsening; unemployment was increasing in the face of continued scarce capital thus forcing the adoption of birth control measures by a regime whose social tenets directed that a rapidly growing population was its greatest asset. The regime was thus forced to search for programs on which to utilize labor, its "most valuable asset." These programs included a vast number of labor-intensive projects of massive proportions designed to advance the economy by "great leaps"—thus suggesting the name of the movement.

Structure.—It became necessary immediately to find an institution commensurate with the administrative and control mechanisms required to direct the efforts of large and diversified work groups and to synchronize such efforts toward a common ideological as well as economic objective within a given area. After experimental amalgamation of several large collectives which answered the problem of size but did not satisfy the ideological factor, the party adopted Mao Tse-tung's recommendation that the new organization should infuse "industry, agriculture, commerce, education, (and the militia) into a big commune (which should form the) basic unit of the society."⁴⁸

Following the adoption by the Central Committee on August 29, 1958, of a resolution "On the Establishment of People's Communes in Rural Areas," a movement of avalanche proportions to organize communes apparently far exceeding the committee's recommendations, swept the country. By the end of October some 26,500 communes had been set up, comprising 122 million households, or 98 percent of all peasant households.⁴⁹ By the year's end almost 750,000 collective farms and over 123 million peasant households had been organized into 26,578 communes. Later on, by September 1959, consolidation and reorganization changed the number of communes to 24,000 with an average of 5,000 peasant households each. The subunits numbered about 500,000 brigades and over 3 million production teams.⁵⁰

Under the commune's organization all economic and administrative activities were brought under one centralized authority for a designated area, the *hsiang*⁵¹ (roughly the equivalent of a U.S. township), previously the lowest unit of local government. The Hsiang People's Congress became the Commune People's Congress; the Hsiang People's Council became the Commune Administrative Committee, and the chairman of the *hsiang* became chairman of the commune. Functionally, the commune's organization was divided into three levels: first, the Commune Administrative Committee for overall guidance; second, the administrative district (production brigade) which formed an intermediary link between the commune and the basic-level units; and third, the production team which was the basic work unit. All sub-

⁴⁶ The estimated annual rate of increase in the gross domestic product was 7 to 9 percent between 1952 and 1957.⁴⁷

⁴⁷ William W. Hollister, "China's Gross National Product and Social Accounts, 1950-57," Glencoe (Ill.) Free Press, 1958.

⁴⁸ Chen Po-ta, "Under the Banner of Comrade Mao Tse-tung," *Red Flag*, July 16, 1958.

⁴⁹ *Statistical Work*, Peking, "The Establishment of People's Communes is Basically Realized in the Countryside of China," Oct. 29, 1958.

⁵⁰ Henry J. Lethbridge, "The Peasant and the Communes," The Green Pogoda Press, Ltd., Hong Kong, p. 74.

⁵¹ This organization varied. In many areas more than one *hsiang* was included in a commune. In 1958 there were an estimated 80,000 *hsiang* and 1,750 *hsien* (country). Thus each county averaged about 14 communes comprising about three to four *hsiang*. There was some talk in 1958 of organizing the commune at the *hsien* level.

units were represented at the commune level by elected delegates through contacts with members of the congress of the commune.⁵²

Administration.—All former administrative and civil functions and the agricultural and economic resources of the *hsiang* were taken over by the commune. The commune became responsible for the education and cultural guidance as well as providing credit, handling savings, performing banking operations, establishing communal kitchens and messhalls, operating nurseries and old peoples' homes, collecting taxes and handling the profits of enterprises under its management. Ideologically, the "free supply" system heralded as the first step toward the Marxian ideal of "to each according to his need," was introduced. It bore no relation to the peasant's productive efforts but amounted to about half the peasant's income and was paid in the form of "free food and welfare services" under the "seven guarantees" pertaining to food, clothing, medical care, education, housing, childbirths, and marriages and funerals.⁵³

Life in the commune was far different from that experienced in any of the preceding socialized entities. Two major overriding factors, as peasants soon learned, was the higher degree of collectivization and the consolidation of peasants from all walks of life into a restrictive social pattern. As the communes came into existence all vestiges of private property vanished; garden plots and livestock were confiscated, and in some instances even private dwellings were taken over. The rural free market virtually passed from existence. The peasant became completely detached from his land and was reduced to little more than a labor input to be shifted from fieldwork to canal digging or from iron smelting to roadbuilding as local and national contingencies required.⁵⁴ The already relentless work pace of the collective was stepped up. Work projects were organized on a military fashion and all physically fit male members within some age groups were required to undertake military functions.

Retrenchment and Revision.—Despite seemingly early successes of the commune system it soon became evident that many of the successes claimed in the name of communal organization were illusory. Priorities were not properly weighted, statistical reporting and analysis were modified to enhance the party image thereby disregarding accuracy. Policies based on inaccurate data had a devastating effect on party leadership as the reality of the situation became apparent. What promised to be China's best harvest by far turned into a disappointment because of a lack of farmworkers to harvest the crops; a large portion of farmworkers had been assigned to literally millions of "industrial" enterprises, such as coal mining, farm implement shops, cement works and the now famous backyard blast furnaces.⁵⁵ The initial announcements of huge successes in late 1958 in both agriculture and industry soon were apologetically recanted and estimates

⁵² Chao Kuo-chun, "Economic Planning and Organization in Mainland China," (Center for East Asian Studies, Harvard University), 1963, p. 164.

⁵³ Richard Hughes, "The Chinese Communes," London, p. 22.

⁵⁴ Philip P. Jones and Thomas J. Poleman, *Communes and the Agricultural Crisis in Communist China* (Food Research Institute studies, vol. 3, No. 1, February 1962) Stanford University Press, p. 8.

⁵⁵ At its peak this campaign is estimated to have directly or indirectly employed 100 million people, which included as much as 40 percent of China's rural work force.⁵⁶

⁵⁶ *Ibid.*, p. 9.

of production were drastically scaled down; but not until after some costly policy decisions had been made by the regime based on initial but erroneous claims of success.⁵⁷

The excesses of the commune system and the abuses brought on by the revolutionary fervor spawned by the Great Leap Forward brought mounting criticism from rank-and-file Party officials. A series of directives, under the guise of "tidying up" the communes, issued between December 1958 and August 1959 greatly modified the character of the commune. Although retaining a strong ideological force, the commune was reduced to little more than a federation of collectives. The administrative structure of the commune reverted to the general civil functions of the former *hsiang* government and the second level of administration, the brigade—roughly comparable to the former collective in size and function—emerged as the key unit for directing economic activity. It became the basic accounting unit as well as being responsible for paying taxes, controlling the food ration, distributing income and directing the activities of the production teams.⁵⁸ Many of the precommune structures began to reappear. The household was again proclaimed the basic unit of society; personal property was returned to households, free food supplies were curtailed, and families were allowed to obtain and prepare their own food. Peasants were allowed to have tiny garden plots and to engage in minor sideline activities, and the work pace slowed somewhat.

Resurgence and Retreat by the Brigades.—The Government re-trenchment was short lived. Leap Forward fever still possessed the regime, and following the 1959 harvest new drives, similar to those in 1958, were launched under the leadership of the brigades. Mess halls which had been disbanded during the spring of 1959 were reopened and their operators made responsible for raising their own vegetables and livestock. Many private plots were recollectivized, and free rural markets disappeared. Massive water conservancy projects, other off-field jobs, and the collection of fertilizers (compost, lake and river mud, and natural fertilizers) occupied about half the labor force, thus greatly altering the labor available for field and crop work in the spring of 1960.⁵⁹ A new campaign for the collective raising of hogs occupied 10 million workers but results were very disappointing; large numbers of piglets died because of disease and lack of feed. A large number of workers were added to the industrial labor force to assist in increasing new and improved farm implements but apparently with little guidance and inadequate blueprints.⁶¹ Despite this renewed effort, results were disappointing and the early harvests in 1960, the second straight year of unfavorable weather, were even poorer than that of the previous year.

⁵⁷ Two outstanding examples were, first, the decision to cut back the cultivated area of land in the agricultural plans for 1959 before reducing original grain estimates by 125 million tons, and, secondly, the decision to further expand industrial production based on the large increase in iron and steel production from backyard furnaces before learning that the new product was essentially useless.

⁵⁸ *Ibid.*, pp. 10-12.

⁵⁹ Only about 55 percent of the farm labor force was available compared with the usual 80 percent.⁶⁰

⁶⁰ T'ao Chen'lin, "A Number of Questions Concerning the Mechanization of Agriculture in Our Country," *Red Flag*, Mar. 16, 1960.

⁶¹ A major achievement was the development of a simple rice planter. Although 4.5 million were made, they were impractical and only a few were used experimentally.⁶²

⁶² New China News Agency, Peking, *Rice Transplanters To Be Used on 70 Percent of China's Rice Fields This Year*, Apr. 14, 1960.

As the 1960 crop year progressed numerous instances of failure of the programs of the brigades appeared. A disillusioned and skeptical party, sensing the imminent reality of a poor crop, assigned cadres to "strengthen leadership" at all levels (provisional, district, and county) of supervision and to weigh the harvest carefully and report the results honestly.⁶³ The results confirmed the suspicions of a lean harvest. In the face of widespread famine, immediate and far reaching action was taken to conserve food and reduce the energy expended by the population. A wholesale suspension of construction and special work units occurred. Superintensive farming practices were discontinued, and vast numbers of peasants released from brigade supervision were assigned to production teams where they reverted to more traditional farming and sideline activities. Trade policy was drastically changed. Exports of food were curtailed and China became a net food importing country for the first time under Communist rule.⁶⁴

The character of the commune system underwent an almost complete change during 1961. Mass labor drives and crash programs were eliminated. Not over 5 percent of the available work force could be utilized for brigade or commune projects leaving 95 percent under production team jurisdiction. Teams were required to retain at least 80 percent of these workers for field work during the busy season.⁶⁵ The production team was given considerable autonomy in planning and carrying out farming operations. Production brigades retained ownership of land and other means of production. Private plots, aggregating about 5 percent of the collectively owned land, were returned. The free market again returned to the countryside. Despite these changes, agricultural production in 1961 remained a disappointment—partly because of unfavorable weather.

Following the disappointing early harvest in 1961, no effort was made to retain any of the features of the original commune except its name. The mess halls were abandoned and the system of free supply was displaced by incentive pay based on the amount and quality of work.^{66, 67} The regime directed that where possible smaller work units, called squads, resembling the former mutual-aid teams, should be allowed to undertake production functions; this development, however, appears to have been only temporary. By the end of 1961, after 4 years of experimentation in large scale production and centralized control of production, the Communist regime had fostered a return to "capitalistic tendencies" (private plots and the free market), having proved that its system of large-scale farming enterprises was unworkable in China.

Further Reorganization—The Production Team.—The 1962 New Year's Day editorial of the *People's Daily* designated the production team, as the "basic accounting unit." A portion of its product was to be delivered to the brigade as a general reserve fund, welfare fund,

⁶³ *People's Daily*, Peking, Nov. 30, 1960, "Develop a Realistic Style of Work—Perfecting the Weighing and Storage of Food Grains."

⁶⁴ Grain imports amounted to 5.6 million tons in 1961, essentially all of it from the free world. This level of imports not only continued but has increased during subsequent years.

⁶⁵ *People's Daily*, "Appropriately Use Labor, Raise Labor Productivity," Peking, Dec. 18, 1960.

⁶⁶ American Consulate General, Hong Kong, *Survey of China Mainland Press*, No. 238, Oct. 17, 1961.

⁶⁷ The decision to allow peasants to manage their own food supplies and to eat at home appears to have been influenced primarily by the shortage of grain, since food was the main incentive item during 1961.

and for managing costs, but the major portion of the team's production was to be disposed of by the team. Thus, the communes and brigades declined as effective production units. There is little indication that the commune presently shares ownership in the agricultural sector. However, rural communes retain a modified structure on grounds that they still integrate Government administration and operate industries, handicrafts, and commerce within their jurisdiction.⁶⁸

The socialist agricultural organization which now exists has little or no counterpart in the Communist world, and appears to be lower than the stage of collectivization reached before the Leap Forward period in 1958. The production team is a compromise. While retaining for the Government a tolerable degree of quasi-socialistic control, it also features a degree of independence for the peasant. In its scope of organization, size, activity, work plans, and divisions of output it resembles the former lower stage APC (averaging between 20 to 40 households). Ownership of the land is vested in the production brigade which resembles somewhat the former higher stage APC.

Few clues exist as to the form the agricultural unit will eventually assume. In 1964, it was announced that reorganization and further consolidation had resulted in increasing the number of communes to 74,000, with an average of about 10 former higher stage APC's or collective farms per commune.^{69, 70} Liao Lu-yen, then Minister of Agriculture, stated in 1960 that the transition from brigade ownership to commune ownership "will be decided after 1965; it remains to be seen what the conditions will be then."⁷¹ However, no major changes have yet been made public in the yet unannounced Third Five-Year Plan.

State Farms

The "highest" level of socialist organization in agriculture in Communist China is the state farm, which receives preferential treatment. All labor is hired, compensation is by wages, and all property is owned by the state. Early in the socialization drive state farms were established, one or two to a *hsien* (country). Together with tractor stations they were to assist in the socialization drive, develop better farming techniques through experimentation, provide technical guidance to mutual-aid teams and APC's, demonstrate farming techniques and the use of new farm implements, and be models of efficiency.⁷²

Under the newly organized Ministry of State Farms and Land Reclamation in May 1956 state farms were assigned the additional role of reclamation. Since then state farms have been created and expanded mainly (though not exclusively) through state financed reclamation and settlement. The larger state farms are located in remote, sparsely populated frontier regions, areas along the coast and in hilly and mountainous areas.⁷⁴ Because of the remoteness of these

⁶⁸ *Ibid.*, pp. 49-51.

⁶⁹ The organization of new communes reportedly was confined largely to mountainous areas where minority nationalities, language differences, and limited communications limited the size of the commune.

⁷⁰ Werner Klatt, editor, *The Chinese Model*, Hong Kong University Press, Hong Kong, 1965, p. 114.

⁷¹ Cheng Chu-yuan, *op. cit.*, p. 19.

⁷² A survey by the Ministry of State Farms and Land Reclamation of 220 state farms (about one-third of the total) in March 1957 found that in 1958 one-third of the farms surveyed lost money and that in some provinces more than half the farms surveyed lost money.⁷³

⁷³ *People's Daily*, Peking, Mar. 11, 1957.

⁷⁴ A large part of the farmland in northwest China around the oases at the edge of the Takla Makon Desert, the Tarim River Basin, the Dzungaria Basin and the Ili River Basin is under state farm control and management.⁷⁵

⁷⁵ New China News Agency, Peking, Mar. 13, 1964.

farms, labor is scarce, especially at peak seasons. Relative to other farming enterprises, state farms are highly mechanized.⁷⁶ The highest degree of mechanization is in the plains area, but in recent years there has been an increase of mechanization in the paddy areas.

A large number of small state farms have been used as experimental and demonstration farms in recent years.

Some state farms specialize in forestry, animal husbandry, or fisheries. Despite claims of superiority in production and management, there seems to have been only a small increase in the area under state farm control since 1961. At the beginning of that year it was claimed that 2,490 state farms⁷⁸ controlled 12.8 million acres of cultivated land, hired 2.8 million laborers, and owned 28,000 tractors (in standard 15 horsepower units).⁷⁹ Incomplete reports in 1964 revealed little or no change in the amount of land under state farm control, but gave a figure of 6,400 state farms of all sizes.⁸⁰ It is believed, that, because of the high cost of organizing and equipping state farms, much of the land reclamation in recent years has been assigned to teams in the communes since these units must furnish their own labor and capital.

DEVELOPMENTS IN AGRICULTURE

Basic Policy Thwarted

The Communist regime in China faced a formidable task of developing an isolated economy stagnated because of overpopulation, undeveloped industrial and resource base, primitive agriculture, low-level technology, extremely inadequate transportation and communication systems, and no reliable source for capital accumulation.

The regime accelerated its program of gaining control of the major sectors of the economy, and initiated its long-range development plan 2 years ahead of its formal acceptance. The following analyses attempt to evaluate these and subsequent developments in tracing the effect of the socialization program by the Communist regime on China's agriculture.

POLICY

The Communist regime's plan was to establish a socialist society by socializing and industrializing all the sectors of the economy. Social welfare, while often mentioned, was relegated a secondary role. Agriculture was to enjoy the fruits of industrialization through mechanization, which was originally programed to take place over a period of 20 to 25 years, for the estimated 65 percent of the cultivated area considered suitable for such developments.⁸¹ By the end of 1956, socialization had been completed for essentially all sectors of the economy. In agriculture, policy concentrated, for the most part, on the

⁷⁶ Although state farms occupied less than 5 percent of the total cultivated area in 1964, they had 32 percent of the tractors, 50 percent of the mechanical farm tools, 82.5 percent of the combines, and 68 percent of the motor trucks.⁷⁷

⁷⁷ American Consulate General, Hong Kong, *Selections from China Mainland Magazines*, No. 451, Jan. 11, 1965, p. 6.

⁷⁸ These are believed to be large state reclamation farms resulting primarily from reclamation projects.

⁷⁹ Hung-Ch'i (*Red Flag*), Peking, No. 7, Apr. 1, 1961.

⁸⁰ New China News Agency, Peking, Sept. 1, 1964.

⁸¹ Choh-ming, Li, *Economic Development of Communist China*, University of California Press, Berkeley, 1959, p. 8.

development of the socialist structure. Errors and mismanagement ended in a state of chaos in agriculture. Since 1960, there has been an embarrassingly long period of "readjustment" during which the Third Five-Year Plan was postponed 3 years.⁸²

Failure of the Second Five-Year Plan resulted in drastic economic and political changes. Confronted with rapid decline in the agriculture sector and a heightening food crisis, the regime put together a patchwork of emergency measures to stave off national disaster. The withdrawal of Soviet technicians and technical aid made the problems more difficult. Capital construction was sharply reduced in 1961, and industrial output, particularly that of light industry, which is heavily dependent on agricultural raw materials, declined for the second straight year. Exports of agricultural commodities were drastically reduced and industrial product imports were supplanted with imports of food. Rationing was intensified, the amounts were reduced and heavy penalties were imposed for speculation and black market activities in an attempt to stem inflation.

Implementation of agricultural plans failed partly because of a lack of funds in two critical areas. Short-term credit to individual farmers and collectives was inadequate, difficult to administer, and lacked flexibility. State investment funds for financing large projects on a long-term basis were spread too thinly among numerous improvement programs. Of the approximately 8 percent of state investment funds which were allocated for agriculture during the First Five-Year Plan,⁸³ about two-thirds went for water conservancy alone.⁸⁴ Other measures such as mechanization, seed improvement, pest and disease control, land reclamation, multiple cropping, and chemical fertilizer were not applied in sufficient measure.

Although greater investment in agriculture was effected in 1961, much of the investment went to support industries such as chemical fertilizer, and machine building. During 1965 there was a de-emphasis on sophisticated farm machines in favor of semimechanized equipment and tools.

New Economic Policy

A new economic policy was outlined at the March-April session of the Second National People's Congress in 1962. A program announced by Premier Chou En-lai provided for an increase in agricultural production especially in grains, cotton and oil-bearing crops; gave agriculture first priority followed by light industry and heavy industry, with special emphasis on increasing the output of daily necessities; provided for a cutback on capital construction and set standards for inventorying materials and controlling the use of state funds and materials; provided for a reduction of urban population by returning workers to the country; strengthened state procurement and broadened the scope of foreign trade; provided for improvement in fields of culture, education, scientific research and public health; and set standards for reducing costs, increasing revenue, and for contributing to the improvement of the country through thrift and hard work.

⁸² The Third Five-Year Plan was originally scheduled to commence in 1963.

⁸³ Eckstein, *op. cit.*, p. 43.

⁸⁴ Klatt, *op. cit.*, p. 105.

The regime emphasized its new policy with the slogan "agriculture as the foundation and industry as the leading factor." Under the new policy no clear-cut guidelines were established nor concrete proposals formulated. Following the belated Second National Peoples' Congress in late 1963, the Lei Feng emulation campaign, which hit its peak in 1964,⁸⁵ metamorphosed into a "class struggle" to convince the population that the overthrow of the capitalists and bourgeoisie was not complete and that "sprouts of capitalists" were emerging among young people who were not aware of the great struggle to establish and maintain the "people's republic" under the present regime.

Class struggle was enmeshed into the broader "Socialist education" drive of late 1964 in which the "collective spirit" was to be consolidated by convincing peasants to place collective work ahead on individual desires so that the individual's circumstances will improve as the collective economy becomes more affluent. This campaign was aimed at peasants who devoted their energies and inputs to their private plots at the expense of the production team effort. During 1965, the campaign was intensified under the banner of the Socialist education movement and was directed mainly at the supposedly "un-corrupted" poor, or former landless, peasants through a series of nationwide congresses. The intensity of the program during the year, the adoption of a new national Socialist hero, Wong Chieh, soundings by various officials about the potential of the economy to support a Great Leap Forward,⁸⁶ which later were toned down to "new upsurge," indicate a continuing though modified belief by the regime that achievement of the goals of the Socialist education movement could be attained—hopefully in a comparatively short time.

During the latter part of 1965 a general "cleaning up" of the cadre resulted in closer cooperation between the working and administrative levels of supervision. Considerable streamlining in recordkeeping and statistical reporting was accomplished along with extending the system of political commissars to the agricultural sector.

Two major announcements were made during the latter part of 1965. The first was that state procurement in 1965 would not exceed that in 1964 in order to allow production teams to build up grain reserves. The second announcement reiterated the regime's support for private subsidiary production including that from private plots. The policy on private plots categorized them as "playing a very important supplementary role." Subsequent official statements, however, cast considerable doubt on the regime's sincerity in tolerating the private plots. Instead of announcing the Third Five-Year Plan at the National People's Congress, which was not held in December as originally announced, the regime closed out the year by stating "it is imperative to mobilize all the productive forces that can be mobilized and put them to work in order to make up for the deficiencies of the Socialist economy."⁸⁷

⁸⁵ Lei Feng was a legendary but ordinary hero of the People's Liberation Army. He accidentally lost his life in line of duty after he supposedly pledged his heart and soul to Mao and the great revolutionary movement of his countrymen.

⁸⁶ In honoring Premier Chou En-lai at the Hopeh Congress of Poor and Lower-Middle Peasants the Hopeh Daily editorial, Mar. 16, 1965, stated that "a new leap forward can certainly take place and a big increase of production can be achieved."

⁸⁷ *People's Daily*, Peking, Dec. 4, 1965.

EDUCATION AND TECHNOLOGY IN AGRICULTURE

The Communist regime recognized early in its tenure that in order to spread its Marxist gospel, as it unconditionally must, and to provide guidance in the development of the country, it must first elevate the 80 to 90 percent of the population which was illiterate and which comprised most of the people engaged in agriculture to an acceptable level of literacy. Expediency became the guiding principle of educational development rather than quality. To launch its monolithic program of development, the regime drew heavily on the technical as well as the capital resources of other Communist countries, especially the U.S.S.R. It sent many of its more promising students abroad for training and began using as many of the indigenous trained and qualified personnel as their Marxist orientation would permit.

To the Communists, education is far more than schooling. It is not distinguishable from indoctrination, propaganda, and agitation. Everything that produces an impact on the minds of men and brings about changes in behavior and thought must be considered a phase of education.⁸⁸

While admitting little or no progress in educational developments during the first 3 years when the economy was being stabilized, the regime accelerated the rate of expansion in the First Five-Year Plan. By 1957, 10 percent of the national budget, a fourfold increase compared with 1951, was assigned to "social services, culture, education, and science."⁸⁹ Under the expansive spirit of the Great Leap Forward upwards of 100 million persons reportedly were absorbed into the educational system⁹⁰ and an even larger number into various types of spare time and on-the-job training and literacy programs including those for adults throughout the agricultural sector where about 50 million peasants were in illiteracy classes.⁹¹ As indicated in Hung-Chi (Red Flag) No. 3, February 1, 1960—

We have put into effect a program with equal emphasis on schools operated by the state and those operated by factories, mines, enterprises, governmental organs, civic bodies, armed forces, peoples communes, cities and street organizations; on full-time, part-time, and spare-time education; on popular education; and on tuition-fee and tuition-paying education.

Although possibly overstated by Jen-min Jih-pao (*Peoples Daily*), December 31, 1965, that "everyone in China today—worker, peasant, soldier, intellectual, student, housewife—belongs to some kind of organized study group," the achievements in sheer numbers affected by the education program has been phenomenal.

The measure of literacy set by the government was the mastering of 1,500 Chinese characters by peasants and 2,000 for workers, less than half the number (4,000) required of primary-school graduates. Two linguistic reforms were introduced to speed the learning process. One was the development of simplified characters and the other was a romanized alphabet. The latter provided a unifying effect since the alphabet could be learned only by mastering the Peking dialect. Re-

⁸⁸ Leo A. Orleans, *Professional Manpower and Education in Communist China* (National Science Foundation), U.S. Government Printing Office, Washington, D.C., 1960, p. 13.

⁸⁹ *Ibid.*, p. 16.

⁹⁰ *Peoples Daily*, Peking, Oct. 8, 1958.

⁹¹ K. E. Priestley, *Education in China*, Dragon Fly Books, Hong Kong, 1961, p. 50.

portedly, the new system cut the time from 2 to 3 years to 4 to 5 months or about 120 hours of study to master 1,500 characters. This level of literacy is about sufficient to barely read the local newspaper. The most important accomplishment of the education program, however, is the fact that after 17 years a large part of a new generation has grown up under the tutelage of the Communist system. The shorter life span thus is advantageous to the regime in its indoctrination program.⁹²

Western educators who have visited educational institutions in China observed that the work at agricultural colleges and universities is on the level appropriate to an apprentice or technician and that basic research is being neglected. In the newer formed institutions—since 1958—the level more nearly conforms to an even lower level in filling the country's need in terms of physical labor as well as technical training.⁹³ Short-cut methods of training and part-work, part-study schools have reduced the number of courses and hours of study. Also, the newly adapted method of selecting students for admittance to institutions of higher learning most assuredly will lower standards even further.⁹⁴

By 1965, 75 to 90 percent of the recipients of degrees from institutions of higher learning in the fields of engineering, science, agriculture scientists were 35 years of age and younger. Almost 60 percent of the agricultural scientists were 30 years old and younger. Less than 6 percent were 50 years of age and older.⁹⁵ Thus, in a few years the younger, less experienced scientists—a very small percentage of whom have degrees beyond an equivalent 4-year college degree in most Western countries—will replace the remnant of Western trained scientists who have played an important role in guiding the developments in agriculture under the Communist regime.

Technology in Agriculture

Agriculture, along with industry and national defense, was singled out by the Chinese People's Political Consultative Conference before the Communist regime's formal assumption of power as one of the three major fields to be developed through the scientific approach. Rewards were to be given for scientific discoveries, developments, and inventions. The conference's emphasis on "love of science," however, had little consequence, since most of the Communist hierarchy had no knowledge of science or any concept of scientific methods and procedures. It was not until 1956 that the regime—with the assistance of Soviet experts—mapped out a general plan for the development of science and technology patterned after that of the Soviet system. The blueprint known as the 12-year plan under the National Agricultural Development Program (1956-67), was hammered out over the issues of central control versus free development of science and technology, basic versus applied research, specialist research versus the "mass line," and gradual development versus the "leap forward"

⁹² *Ibid.*, pp. 62-66; Orleans, *op. cit.*, pp. 48-55; Klatt, *op. cit.*, pp. 31-46.

⁹³ Priestley, *op. cit.*, pp. 49-50.

⁹⁴ On June 13, 1966, a directive (*Peoples Daily*, Peking) closing competitive entrance examinations and admittances for 6 months to institutions of higher learning directed that henceforth students would be selected by recommendation of party cadres thus giving children of poor peasants more equality with urban students.

⁹⁵ Calculated from Cheng Chu-yuan, *Scientific and Engineering Manpower in Communist China, 1949-63* (National Science Foundation), U.S. Government Printing Office, Washington, D.C., p. 125.

approach.⁹⁶ Except for a brief period—during the “blooming and contending period” in 1957 when academic freedom was granted, the Party has maintained strict control over scientific and technological developments in agriculture.

The Academy of Agricultural Science was organized in 1957 as the national center for agricultural research and development. Its functions were—

. . . to meet the requirements for national plans of development, for agricultural production practices, and for the development of agricultural sciences within and outside the country; thus it was to organize and lead the agroscientists in basic as well as in applied research in agrotechnology.⁹⁷

The status of the Academy increased substantially in 1961 with the Party's decision to make agriculture the foundation of the national economy. One-third of the approximately 80 scientists at the Academy hold posts in the Chinese Academy of Sciences, and a large percentage are western trained. The Academy controls more than 30 institutes in different parts of the country together with numerous field research stations and seed development centers. The majority of these institutes are devoted to the study and analysis of single crops, while others concentrate on specific branches of agricultural science.⁹⁸

Over half of the existing agricultural colleges, including the Agricultural University at Peking (which has been moved to the countryside), are experimenting with the part-study, part-work schools, and over two-thirds of the 307 lower level secondary agricultural schools have adopted them. These schools, particularly those at the secondary level, serve the communes which supply the students and take them back at the end of the school term. By 1960, over a fourth of the students (3 million) in junior middle schools were enrolled in 30,000 agricultural middle schools. The curriculum was divided about equally between study and directed work. School schedules were coordinated with production plans and the type of agriculture, depending on the area. Formal courses include mathematics, physics, chemistry, biological and language studies taken during the slack season. Students in increasing numbers participate in all the varied activities of production during the cropping season. A recent national conference on education (August 1965)⁹⁹ decided that apart from certain departments and classes for special purposes, all new agricultural colleges and lower level schools should conform to this system. The number of colleges and secondary schools is to be increased in the provinces, municipalities, and autonomous regions. The conference concluded on the note that—

With the entire new generation equipped with Socialist consciousness and culture, scientific and technical knowledge, capable of both manual and mental labor, conditions for passing to Communism will have been created.¹⁰⁰

The various agricultural colleges and institutes are staffed by a large proportion of the roughly 135,000 graduates with agricultural degrees from institutions of higher learning in China since 1928 and

⁹⁶ *Ibid.*, p. 10.

⁹⁷ K'o-hsieh T'ung-pao (*Bulletin of the Chinese Academy of Sciences*), Peking, No. 6, 1957, p. 135.

⁹⁸ Cheng Chu-yuan, *op. cit.*, pp. 26 and 359-362.

⁹⁹ New China News Agency, Peking, Aug. 24, 1965.

¹⁰⁰ *Ibid.*

an unknown number of graduates from colleges and universities in foreign countries.¹⁰¹ An additional large group which has received training in the middle and secondary agricultural schools assist as technicians. A very small percentage, only about 10 to 30 percent, of those who pass entrance examinations have been admitted to the university. Major fields of research and development include general agriculture, forestry, sericulture, tea culture, plant protection, pomology, soil and agricultural chemistry, veterinary science, agricultural irrigation, agricultural economics, animal husbandry, agricultural mechanization and electrification, management of Socialist agricultural enterprises, landscape gardening, agricultural medicine, agricultural meteorology, pedology, forest and pasture management, and others.¹⁰²

Complementary to these specialists are a number of research academies under the direction of various ministries. They include the Research Academy of Water Conservation, the Academy of Machine Building and Manufacture, and the Research Institute of Food and Grains. These institutions concentrate mainly on practical problems rather than on basic research. Each agricultural college operates an experimental farm which must contribute somewhat to the upkeep of the school.

The central theme of agricultural development under the Communists has been the technical transformation of agriculture. Agricultural scientists were directed by Premier Chou En-lai at the 10th plenary session of the Eighth CCP Central Committee's Conference on developing agriculture in 1962 that—

All the good achievements in agricultural science and technology gained by foreign countries, whether Socialist or capitalist, should warrant our study to see if these achievements are applicable to the actual conditions existing in our country.¹⁰³

General guidelines for modernizing agriculture included the expansion of irrigation and flood control, development of better crop varieties and increases in livestock, increased use of chemical fertilizers and pesticides, rural electrification, and farm mechanization. The role of the scientists was to develop through experimentation the best possible methods for developing and executing these programs. Despite the claimed rise in literacy, the regime holds to the traditional technique of the model to explain findings to the farmers. The model was the demonstration farm which has recently become a prominent part of China's rural scene. Technical and scientific personnel have been assigned to these farms. The major functions of the demonstration farms are to (1) consolidate peasants' experiences and techniques, (2) to set a consistent pattern for production, and (3) to conduct studies and experiments to assist nearby farmers. State farms also engage in essentially the same functions as do tractor stations.

¹⁰¹ According to Cheng Chu-yuan, *op. cit.*, pp. 78 and 119 there were 105,206 graduates in agriculture and forestry graduates from institutions of higher learning in China up to 1963. Assuming the same proportion of graduates in agriculture and forestry as previously (8 percent) an additional 20,000 were graduated from the 1963-64 and 1964-65 classes.

¹⁰² *Ibid.*, pp. 259-262.

¹⁰³ Hung-chi (*Red Flag*), Peking, No. 20, 1964, p. 4.

The outgrowth of the demonstration farms is the "guaranteed high yield fields," the ultimate in farm production, whereby the factors of production are so accommodated that the success of a crop does not depend wholly on the weather. To gain this level requires intensive cultivation whose costs are considerably higher. The proportion of cultivated land in high yield fields is not large, but the movement is nationwide, is expanding, and is one of a number of projects which has governmental financial backing. The returns become less fruitful as the project reaches out beyond the areas which can readily and with little investment be brought into higher, more reliable production. There is little doubt that the program will be further delayed as the result of the Cultural Revolution now sweeping the country. At a conference of the Chinese Communist Party Committee of the Chinese Academy of Science in April 1966, the following guidelines were adopted for the "further" and "fast" development of science and technology:

... take the thought of Mao Tse-tung as the guide; take class struggle as the key; let politics command work; adhere to the general line for Socialist construction; pursue the policy of self-reliance; make the intellectuals identify themselves with the workers and peasants, specialists with the masses, and scientific experiment with production practices; follow the mass line; continue to push the scientific and technical revolutions forward; and serve Socialist construction and proletarian politics.¹⁰⁴

Any scientist who still harbors thoughts about "red" versus "expert" need search no farther for an answer.

Accounting and Statistical Analysis

In general, statistics serve the Party, and the tendency is to overstate the unknown. This results from an overabundance of competition in the Party to get ahead or maintain the present position and to deficiencies with respect to the level of competency of those who collect and analyze the data. A high level of illiteracy in rural areas, and the prevalence of varying customs with respect to the meaning of terms used in weighing, measuring, and counting further complicate the task of developing a statistical system. A degree of standardization of weights, measures, and systems of counting, however, has been developed under the Communist regime.

Until the organization of the State Statistical Bureau in 1952 there had been no organized countrywide agricultural reporting service in Mainland China. Two pre-Communist era attempts had been made, but a complete country enumeration had not been completed. In the study of *Land Utilization in China* (1937), by John Lossing Buck, under the sponsorship of the University of Nanking, an attempt was made to delineate the major agricultural regions and analyze the agriculture of each area for the period 1929-33. The other attempt was by the National Agriculture Research Bureau (NARB), which was established in 1932 under the Ministry of Industry at Nanking. The NARB began publishing monthly reports in 1933 with data from 1931 for roughly the same area covered by the land utilization study. By

¹⁰⁴ New China News Agency, Peking, May 31, 1966. Quoted in *Survey of China Mainland Press*, No. 3712, June 6, 1966, American Consulate General, Hong Kong.

1936 over 6,000 reporters were submitting monthly reports from about 1,200 *hsien* (counties). Neither survey included all of China, however. Both omitted the former province of Sikang and the autonomous regions of Sinkiang and Tibet. Chahar Province and most of Manchuria were left out of Buck's study and not all of Manchuria and Kwangsi Province were included by the NARB study, although Chahar was.

In areas where the two surveys overlapped—in about 22 provinces—there were wide areas of agreement within tolerable ranges of divergence, although the objectives differed widely. The NARB's sampling method was oriented to data related to political divisions (provinces), while Buck's sampling was concerned with the delineation of agricultural areas—actually a detailed economic study of China's rural economy within the areas chosen. National aggregates with acceptable validity were not possible with this sampling procedure. Surveys by the NARB thus were the only source compiling national aggregates of planted area and production of agricultural products for the areas covered prior to 1937. Major shortcomings were limitation of crops reported (16) and a strong bias toward underreporting. Data for Manchuria and other parts of China obtained from Japanese and other agencies during the Japanese occupation were not reconciled with NARB estimates. Thus, as one seasoned researcher on Chinese statistics put it in 1951: “. . . all the statistical data published thus far for Chinese agricultural production (are in) the classification of mere estimates.”¹⁰⁵

In the early period of the Communist regime's rule a department of statistics was established under the Bureau of Planning in the Financial and Economic Commission of the Political Affairs Council and in each of the six regional administrations of the country. No statistical units were established below the provincial level, but cadres at the *hsien* level and below were responsible for compiling and reporting data.¹⁰⁶ With the organization of the State Statistical Bureau in October 1952, strenuous efforts were made to establish statistical reporting units in all administrative divisions. In mid-1953 the first national census was taken, and by the end of the year annual budget reports and reports on the fulfillment of the economic plan for the preceding year were being made. Under the guidance of Hsüeh Much'iao, the first director, the State Statistical Bureau extended its services to the rural areas.¹⁰⁷

By 1954, the statistical network had been established at the *hsien* and *ch'u* level and in numerous *hsiang* and village councils. Reporters collected data on sown area, harvest of crops, livestock, developments in socialization of agriculture, and assisted in compiling and certifying annual statistical returns.¹⁰⁸ Village administration became amalgamated with the production brigades in the collectivization drive in 1955-56 and the statistical workers were reassigned. Some degree

¹⁰⁵ T. H. Shen, *Agricultural Resources of China*, Cornell University Press, Ithaca, p. viii.

¹⁰⁶ Administrative divisions up to the formation of communes in 1958 in descending order of jurisdiction were: (1) province (autonomous regions, special areas, municipalities), (2) special district, (3) *hsien* (county), (4) *ch'u* (district or ward in urban areas), (5) *hsiang* (administrative village), (6) villages (hamlets), made up of peasant households. The *ch'u* and *hsiang* administrative areas eventually were incorporated into the communes in 1958.

¹⁰⁷ Cheng Chu-yuan, *op. cit.*, pp. 181-184.

¹⁰⁸ Tung-chi Kung-tso (*Statistical Work*), No. 11, November 1955.

of specialization developed, but for the most part, statistical units did not gain the degree of permanence required for development in rural areas throughout the period of the First-Five Year Plan, nor did the objective reporting and the model survey system originally planned develop. According to Hsüeh, at the end of 1957,

. . . statistical work in rural areas and statistical organization at the *hsein* level have not really been established in most areas up to the present . . . (and) . . . no experience has yet been gained as to how to develop statistical work at the *hsien* level.¹⁰⁹

The State Statistical Bureau attempted to build a national network of statistical services that would operate according to its regulations and needs, but local organizations were not interested in national statistics. The rapid development of collectivization (1955-57) generated needs for statistics of a local nature but little notice of these problems came from the National level. Local Party functionaries, therefore, bypassed the regular statistical units and began developing data collection systems to serve their purposes. A hodgepodge of endless questionnaires flooded the countryside. In their frustration the cadres, having had no training in statistical reporting, were driven to fabricating figures and making poorly conceived estimates.^{110, 111}

Improvement in the organization of statistical services at the *hsien* level and below and replacing of the model survey type of reporting by a more accurate method, crop-cutting sample surveys, were goals in the Second Five-Year Plan (1958-62). The decentralization plan in 1958, however, which resulted in the formation of communes resulted in a complete breakdown of the state statistical system. Party secretaries at the various levels of government activity now directed statistical bodies, organs which reverted to the Model survey—a system serving admirably the purpose of progressive statistics.

What scientific fabric had been built into the emerging statistical system under Hsüeh Mu-Chi'iao during the First Five-Year Plan gave way to statistical programs to serve Party aims under a new chief of the Statistical Bureau, Chia Ch'i-yun, who stated that—

Statistical work is a weapon of class struggle and of political struggle. Our statistical reports must reflect the great victory of the Party's general line and the progress of all the work guided by the Party. They certainly should not be a mere display of objective facts.¹¹²

During the short, turbulent tenure of Chia all published statistics reflected only achievements and triumphs. Great Leaps in agricultural production were reported in the summer and fall of 1958. Statistical services at local levels were placed under the direct control of the local Party committees, and the purge of "rightest elements" and other "bad elements" measurably reduced the more able specialists. By mid-1960 fewer than 75 percent of the communes had a chief statistical officer. The much reduced staff was composed mostly of Party members.

This system was intolerable, and measures were instituted in 1959 and 1960 to overcome the statistical fiasco. A semblance of the original

¹⁰⁹ *Ibid.*, No. 8, April 1958.

¹¹⁰ The differences which existed between the State Statistical Bureau units in the field and local cadres in compiling data likely was reflected in the differences between information published by the Ministry of Agriculture and the State Statistical Bureau.

¹¹¹ T'ung-chi Kung-tso (*Statistical Work*), No. 13, July 1958, pp. 7-13.

¹¹² *China News Analysis, Hong Kong*, No. 324, May 20, 1960, p. 5.

statistical organization began to emerge again. Its reporting services were increased considerably and a direct line of operational command was established all the way down to primary levels in communes and other smaller administrative bodies.¹¹³ Chia Ch'u-yuan was replaced in July 1961 as head of the State Statistical Bureau by Wong Szuhua, an advocate of statistical techniques more in line with those of Hsüeh Mu-ch'iao. Under the new leadership more accurate information became available but only for indigenous use as indicated below.

Scope and Reliability of Agricultural Statistics

There is general agreement among Western analysts that Communist Chinese statistics on agriculture and related fields are grossly inconsistent and unreliable. Wide variations exist, however, among these analysts regarding what constitutes reasonable estimates. Attempts to reconcile differences have not been successful nor has an acceptable statistical link been established between the pre-Communist and Communist eras. Mention has already been made of the numerous gaps in pre-Communist statistics. Under the present regime, it was not until 1956 that a standardized guidebook was published for statistical workers in compiling agricultural data. Statistics on the cultivated area are probably the most accurate of Communist data. During the land reform a complete survey of holdings was made. This should have resulted in a fairly accurate figure, since the survey was carried out by local committees under central direction. Also, in 1953 an enumeration was made of yields at the local level for the purpose of establishing the agricultural tax. Major distortions in reported data began appearing, however when pressure was applied by the Party to register continuous increase in yields under the collectivization program.

The reliability of Communist China's statistics closely parallels the development of methodology in field reporting and in the direction of analysis at the State Statistical Bureau.

Prior to the establishment of the State Statistical Bureau (i.e. 1949-51) no surveys were made on agricultural production. The only source of economic data was state budgets, but the aforementioned survey of farmland likely resulted in fairly accurate data on cultivated area and land utilization. Even after the establishment of the State Statistical Bureau acceptable statistics upon which to base the First Five-Year Plan could not be generated for at least 2 years. During 1952-54 slightly more accurate statistics were available based on a more comprehensive and technically more accurate methodology, at least down to the *hsien* level. The census of 1953 demonstrated some advancement, although admittedly many inconsistencies were manifest.

Prior to 1953 the *shien* or *ch'u* was the basic unit for estimations, which were based on reports and discussions with veteran peasants in villages and local production conferences. During 1953 while the *shien* and *ch'u* remained the base for estimations *shiang* and villages were stratified using a survey method based on a derived model which represented few of the characteristics of agriculture within and between *shiang*.¹¹⁴ The survey method underwent numerous changes

¹¹³ Choh-ming Li, *The State Statistical Systems of Communist China*, University of California Press, Berkeley, 1962, p. 159.

¹¹⁴ T'ung-chi Kung-tso T'ung-hsin (*Statistical Bulletin*), Peking, No. 7, October 1954.

and was almost abandoned in 1954, since more accurate data were needed for the launching of the collectivization drive and for better control under the policy of unified purchase of grains, cotton, and oil-seed crops. Surveys were conducted at the *shiang* level, and the technique of measuring sample cuttings of certain crops appeared in statistical literature in 1956. This method, based on a prearranged sample, continued until the Great Leap Forward. The decision by officials to retain and broaden the cutting survey appears to have been weighted more heavily on insuring against peasant hoarding than upon accuracy of the harvest count.¹¹⁵

A gradual improvement in the scope of agricultural reporting and in the analysis of data began with the establishment of the State Statistical Bureau (in 1952) and reached its peak during the period 1956-57. However, the collectivization of agriculture had a disruptive effect on reporting, with the most notable effect occurring in enumerations in the latter part of 1957. Collectivization drives in 1956-57 and a shift of the inventory date from June 30 to December 31 resulted in unrealistically higher estimates of livestock numbers, especially hogs.

Professional and technical assistance from many Communist Bloc countries, notably the U.S.S.R., and the training of large numbers of promising Chinese students provided a substantial corps of statistical analysts. Party functionaries tolerated the scientific approach to statistical matters and supported a considerable magnitude of data gathering and analyses. They apparently accepted Hsüeh Mu-ch'iao's suggestion in his report to the National Meeting of Agricultural Statistical Work that for agricultural collectives both a system of regular statistical schedules, which require comprehensive survey, and cutting surveys to be carried through on model lots within the collectives.¹¹⁶

Whatever degree of accuracy and validity in reporting had been gained in previous years was lost in the statistical fiasco of the Great Leap Forward. The results of the fanaticism which accompanied the Great Leap movement, were disastrous and became apparent in a comparatively short time but not soon enough to revise plans for reduced crop areas in 1959. In an attempt to get to the root of the problem, a national survey was initiated in April 1959. Harvest results of 1958 were rechecked, and an enumeration was made of the production of the first half of 1959. A three-step method was instituted in estimating the 1959 crops: (1) Forecast output on the basis of area sown through consultation with local competent peasants, (2) cutting surveys for estimating expected output, and (3) a comprehensive survey of the amount of grain in storage following the harvest for each crop.¹¹⁷

This broadened scope of crop estimation brought into clearer focus the concept of barn yields (actual count of the harvest) contrasted to biological yield, resulting from the cutting surveys, and was utilized as a means of correcting the overreporting in 1958. Following a series of high-level conferences, the concept of barn yields was intro-

¹¹⁵ T'ung-chi Kung-tso (*Statistical Work*), Peking, November 1957, pp. 7-11.

¹¹⁶ *Ibid.*

¹¹⁷ Chi-hua Yu T'ung-chi (*Plans and Statistics*), Peking, No. 8, May 1959.

duced, and early in 1959 an official directive was issued stating that agricultural output should be measured by barn yields.¹¹⁸

The result of the recheck of the previous harvest reduced the original 1958 grain production figure by one-third, but still left an official figure far larger than was likely. The thrust of China's statistics since 1959—aside from a continuous blackout of information and deliberate misrepresentation—is difficult to define, but the refusal of the Communist regime to divulge statistical data should not be interpreted as a sign of an inadequate system. There is evidence that the regime has risen above the statistical problems of the Great Leap Forward, and that the State Statistical Bureau has continued to improve its statistical reporting and analyses in the agricultural sector. This improvement, however, has proffered little to the outside world, since official statements combine misrepresentations of data and blackouts of information.

FACTORS AFFECTING PRODUCTION

The 1956-67 National Agricultural Development Program (approved by the second session of the second National People's Congress, April 10, 1960) was formulated as the major guideline for the long-range development of agriculture. This program was to mesh with the three 5-year plans extending through 1967. The general guidelines included in the plan draft were categorized and defined in terms of yearly goals under the 5-year plans, but they were sidetracked by the overriding surge of the Great Leap Forward only to reappear as a submerged foundation for the yet undefined Third Five-Year Plan—to have been completed in 1967 had the original plans been successful.

The plan was designed—according to its preamble—to “increase productive capacity in agriculture rapidly, . . . to reinforce industrialization, . . . and raise the living standard of the peasants as well as all people . . .” The 12-point program for agriculture included: (1) water conservation to develop irrigation and prevent floods; (2) increase the output of natural and chemical fertilizers; (3) improve traditional farm tools and develop mechanization; (4) develop and propagate new strains of seeds suitable to local environment; (5) expand the area of multiple cropping; (6) increase the area of high-yield crops; (7) improve cultural methods commensurate with local needs; (8) improve soil producing capacity and utilization; (9) promote water and soil conservation; (10) protect and increase production of draft animals; (11) exterminate insects and plant diseases; and (12) reclamation of wasteland to expand cultivated acreage.

Mismanagement in the agriculture section upset the balance of one of the most intricate farming enterprise the world has known. Yet the agricultural section was called upon to furnish beyond its capacity with only token response in the form of inputs in return. Allocations to agriculture under the Socialist economic plan have not been sufficient to lift agriculture to the level required for it to meet the contingencies imposed by the regimes industrialization program. Even the stepped-up emphasis for agriculture in post-Leap Forward programs and a deemphasis on industry leaves China more agrarian than before communalization but less able to feed its population from do-

¹¹⁸ *Ibid.*, No. 1, January 1960, pp. 19-23.

mestic production, particularly the urban and industrial sectors. An increasing amount of light industry's output (consumer goods for home consumption) is exported and demands for national defense continue to increase.

The nearest agriculture came to fulfilling its role of supplying the economy with the essentials for economic expansion was during a comparatively few short years prior to 1959 when moderate economic expansion occurred. However, during this period large amounts of foreign aid and technical assistance were available. Radical policies, which spawned the Great Leap Forward, greatly altered the productive powers of agriculture and alienated foreign technical and economic aid. Three years of unfavorable weather heaped on top of this dealt a crippling blow to agriculture and the economy from which they have not fully recovered, upset the Communist regime's timetable for economic fulfillment, and forced the adoption of new economic policies.

The agricultural development program was to be coordinated with the socialization program which also was to be completed by the end of 1967. The program became untracked, however, and numerous modifications—evidence of vacillation and disagreement within the Communist Party—have occurred. Estimates by officials at the beginning of the Third Five-Year Plan extended the period for modernizing agriculture up to 20 to 30 years and even beyond. An analysis of the progress of some of the more important developments in the long-range program enumerated above, as well as those related to the socialization program may shed some light on the lack of success in the development of agriculture.

Investments and Financing

The effort to industrialize as rapidly as possible dealt a double blow to agriculture. In the first place, it denied the agricultural sector the initial volume of investment necessary to stimulate the high level of output required to meet the demands placed on agriculture to support industrial development. Secondly, it skimmed off such a large portion of the sector's production that self-generating funds, which otherwise would have been invested in development programs at lower administrative echelons, did not materialize in sufficient volume to compensate for low state investments. Peasants found it necessary to rely increasingly on credit for carry out farming operations with little or no means for capital improvement.

During the First Five-Year Plan (1953-57) the government allocated about 8 percent of total state investment funds for agriculture, forestry, water conservancy, and meteorology compared with over 4 times that amount for industry. According to the draft of the First Five-Year Plan, 6.1 billion yuan¹¹⁹ were allocated to agriculture, water conservancy, and forestry departments of which 3.26 billion yuan were earmarked for capital construction within those departments. Funds to be used indirectly, in the agricultural sector in the form of relief funds, agricultural loans, and reclamation by units outside the agriculture sector increased the potential amount to 8.4 bil-

¹¹⁹ Yuan values may be converted to U.S. dollars at a rate of exchange of 2.46 yuan to U.S. \$1. This rate does not necessarily reflect the value of the yuan in terms of the dollar.

lion yuan. To this amount was added an expected 10 billion yuan representing investments by peasants, with 6 billion to be used to increase fixed assets and 4 billion for circulating capital.¹²⁰

Investment funds were categorized into (1) capital construction (building of houses, purchase of machinery, appliances and equipment, construction of dams and tunnels); (2) operating expenses (establishment of and maintenance of service organization, and operating expenses for projects aimed at increasing production, and subsidies for various projects utilizing peasant labor); (3) and working funds (working capital for various agricultural enterprises and undertakings including state farms, state livestock farms, state forests, machine tractor stations, and so on.¹²¹ Expenditures in the first two categories were almost equal: capital construction, 3,864 billion yuan and operating expenses, 3.82 billion yuan; working funds amounted to 213 million yuan.¹²² Not only did agriculture suffer a low priority for investment funds, the investments that materialized were confined mainly to the socialized area and particularly the development of state farms, state livestock farms, herb medicine enterprises, and other (Socialist) agricultural enterprises. Investment in reclamation of wasteland by state farms and livestock farms under the Ministry of Agricultural Reclamation was about 1.1 billion yuan during the First Five-Year Plan. A total of 93,000 hectares were reclaimed. The purchase of agricultural machinery for state farms and machine tractor stations (8,885 and 22,622 tractors, respectively, in 15 horsepower units) represented the major expenditure for agricultural machinery. Investments in water conservation constituted an estimated 2.34 billion yuan, 62 percent of total state investments for capital construction in agriculture during the First Five-Year Plan. These were utilized for flood control (49.4 percent), irrigation (20.2 percent), drainage (19.9 percent), and soil conservation (10.5 percent).¹²³

Numerous limitations confront any effort to expand the area of cultivated land in China. Because of this, investments in agriculture have been of a yield-increasing type. The major effort has been toward reducing fluctuations in the harvests. These activities have been aimed at limiting flooding on the one hand and increasing the irrigated area on the other. The third element is the increased application of chemical fertilizer which combined with the other two was to insure the "guaranteed high-yield field". Irrigation and flood control projects have been of the labor-intensive types. The near exclusion of capital and basic materials has been a factor in limiting the effectiveness of the labor-intensive projects, and the mismanagement that has accompanied the making of plans and their implementation has resulted in many technically deficient projects.

The Second Five-Year Plan allocated about 10 percent of total state investments to agriculture.¹²⁴ The agricultural bank, which was in existence from 1955 to 1957 to finance the rapid collectivization

¹²⁰ *First Five-Year Plan for Development of the National Economy of the People's Republic of China in 1953-1957*, Foreign Language Press, Peking, 1956, pp. 27-33.

¹²¹ Han po, *Chi-hua ching-chi (Planned Economy)*, Peking, No. 2 1958.

¹²² Shigeru Ishikawa, *National Income and Capital Formation in Mainland China*, (The Institute of Asian Economic Affairs), Haku-o-do, Tokyo, 1965, p. 161.

¹²³ *Ibid.*, pp. 161-163.

¹²⁴ State Statistical Bureau, *Ten Great Years*, op. cit., p. 53.

drive, was reestablished in the fall of 1963 to provide greater control over financial matters in rural areas by attempting to mobilize untapped rural savings which could be used to strengthen the available supply of rural credit at the so-called credit cooperatives. Available information does not indicate the scope nor the authority of the bank to handle the monetary affairs in the agricultural sector. However, much of the current investments in agriculture is not connected with the bank, since the major investments in agriculture are through the industries which support agriculture. The bank's main function so far (besides its control mechanism on local currency) is that of providing agricultural loans. Amounts of loans ranging up to 2 billion yuan per year have been claimed.¹²⁵ This amount is questionable in light of other official statements that funds for loans would have to come primarily from repayments of previous loans.¹²⁶

Aside from the claim of 10 percent of state investments earmarked for agriculture in the Second Five-Year Plan, which became defunct, information on the extent of investment in agriculture since the Great Leap Forward is extremely limited. Nevertheless, it is evident that increasing investments were poured into agriculture—much of it in the form of emergency programs during the depression years of 1959–61. After more than a year of reassessing the imbalance caused by the Great Leap Forward a new program for economic development—based on the slogan of “agriculture as the foundation and industry as the leading factor”—was announced at the National People's Congress in the spring of 1962. First priority was given to agriculture to help it catch up and second priority was given to light industry. The pattern of investment was drastically changed with a greater share allocated to agriculture and consumer goods industries. Farm incentive programs including lower taxes, price adjustments, reduction in crop collections and more autonomy at the production level were established. Emphasis was given to increasing the output of industries directly connected with agriculture, notably chemicals (especially chemical fertilizers), machinery, electricity, petroleum, and other related industries.

The new program has had a beneficial effect on agriculture and has resulted in substantial gains in certain sectors of the economy, although not all goals have been attained. Agricultural inputs have increased sharply. Had not unfavorable weather counteracted the beneficial effects of increased inputs in 1965 and 1966 there is little doubt that agricultural output would be at an alltime high. This was the goal the regime hoped to attain at the beginning of the Third Five-Year Plan, which began in 1966. Those industries supporting agriculture appeared to be continuing to increase output. The large imports of chemical fertilizer already contracted for delivery in 1967, the continued emphasis on expanding the production of chemical fertilizer, increases in the production of machinery for agricultural purposes and the continued high level of imports of goods to aid the agricultural sector indicate that the regime intends to continue a strong policy of supporting agriculture.

¹²⁵ New China News Agency, Peking, May 15, 1965.

¹²⁶ *People's Daily*, Peking, Jan. 28, 1964.

*Irrigation and Water Conservancy*¹²⁷

A major problem confronting China's agriculture is the unbalanced distribution of water. In the northern part (north of the Tsinling Mountain) the problem is scarcity, whereas in the southern part the problem is control of a generally overabundant supply. In a wet year the north generally fares better, while flooding and water-logging may destroy crops in the south. A dry year brings great damage to crops in the north but often results in less crop loss in the south. Between these extremes local conditions of rainfall or lack of it presents the peasant with a continuing problem of attempting to make nature serve his purposes.

Efforts prior to 1949 to initiate countrywide water conservancy projects were meager and consisted mainly of simple irrigation of crops. Irrigation techniques were primitive and amounted to little more than drawing water directly from streams by gravity flow or by some simple mechanical (mainly human operated) means. Such systems were entirely dependent on streamflow. Limited utilization was made of wells in the northern areas of the country and reservoirs in the south, where water generally was abundant. Visiting western irrigation engineers had pointed out the impracticability of building reservoirs on the extensive loess areas of northern China because of erosion, a high rate of seepage, and silting problems. Silting of rivers over the years and the building up of river banks has resulted in river beds rising well above the level of the land through which the rivers flow in the northern flat country.

The water conservancy program was elevated to national scale by the Communist regime in 1949, and a considerable degree of success has been attained despite numerous failures. Officially, ". . . the main task of water conservancy are to alleviate the disasters of flood and drought to insure a steady increase in agricultural production, and to promote the development of industry and river navigation."¹²⁸ The immediate goals of the new government were the prevention of floods, the drainage of waterlogged fields, and the construction of irrigation canals. In 1956 a program was outlined to eliminate ordinary floods and drought within 7 to 12 years. It was claimed that of the approximately 58 million hectares of cultivated land in the plains area and about 47 million hectares in the hilly and mountain regions, only a small portion had an optimum supply of water.¹²⁹ Roughly 20 million hectares of land were irrigated in Mainland China in 1932.¹³⁰ The Communist regime claimed that by 1949 there were about 16 million hectares of irrigated land of which 76 percent needed re-building.¹³¹

Initially, irrigation programs assigned priority to flood control projects. This included the building and strengthening of river dikes along major rivers and their tributaries. This phase was essentially completed during the period 1949 to 1952.¹³² But haste in getting the

¹²⁷ The American equivalent of the Chinese "Water Conservancy" (Shui-li) is "water resource management."

¹²⁸ *Water Conservancy in New China*, Peking (The Ministry of Water Conservancy) 1956, preface.

¹²⁹ Chao Hsüeh, "The Problem of Agricultural Mechanization in China", *Chi-hua Ching-chi (Planned Economy)*, Peking, No. 4, Apr. 9, 1957.

¹³⁰ George B. Cresser, *China's Geographic Foundations*, First Edition, New York, 1934, p. 97.

¹³¹ *New Agricultural Journal*, Peking, No. 5, Mar. 8, 1958.

¹³² New China News Agency, Peking, Sept. 13, 1952.

projects under way and deficiencies in training and management resulted in numerous problems and failures. Programs were not co-ordinated between provinces; strengthening of the dikes along the Huai River in Honan Province contained waters from heavy rains, but downstream in Anhwei Province dikes were washed out. Other projects during the pre-1952 period included minor irrigation facilities, generally small-scale projects at the farm level. Large dams and multipurpose projects were to come later. Total hydroelectric power, for example, was only 180,000 kilowatts in 1952.¹³³

Major problems became apparent as the water conservancy program progressed. The most critical included an acute shortage of capable technical personnel, the inability or unwillingness of the regime to provide adequate funds, the absence of soil surveys to provide information of subsurface structure, and a lack of coordination between state and local officials on the scope and extent of projects to be undertaken. The state retained responsibility for harnessing large rivers and for constructing large irrigation projects. Medium-sized projects were to be built with state aid and small-scale projects by the masses. The state retained the better technicians including the Soviet experts and benefited from irrigation development plans inherited from the previous regime which had hired foreign technicians (mostly American) to construct them.

Beginning in 1952, a major spurt occurred in water conservancy. Large-scale projects were initiated by the government, and more emphasis was placed on the irrigation of farmland. Investment funds were allocated for a series of dams, reservoirs, and canals which were concentrated principally in provinces of east and central China along the Huai, Yungting, and Yangtze Rivers. When the Great Leap occurred in water conservancy, new projects also were started to the north and south of the initial thrust. The newer projects were located on the upper reaches of some of China's larger rivers and many of them dwarfed the earlier projects. While the largest reservoir of the earlier period had a capacity of about 2 billion cubic meters of water storage capacity, the Liukia Gorge project on the Yellow River near Lanchow had a storage capacity of about 5 billion cubic meters. The largest of all, the Sanmen Gorge project near Loyang, several hundred miles downstream in the same river, had a goal capacity of 65 billion cubic meters.^{134 135}

Projects based on Soviet design were begun during the First Five-Year Plan. The need for a more rapid increase in the irrigated area to increase agricultural production set off a new "upsurge" in irrigation in 1956. It was decided that further development of large projects was not possible, because of a lack of funds and material, and attention was shifted to the development of small projects. The water conservation program was considerably decentralized, and peasant labor was organized in a frenzied attempt to build a mass of small projects, primarily wells. Although the pace slackened in 1957—to allow time to rectify mistakes of previous years—it gathered

¹³³ K. C. Yeh, *Electric Power Development in Mainland China*, Rand Corp., 1956, p. 72.

¹³⁴ Edwin R. Reubens, "Water Control and Labour Mobilization", *This Is China*, Dragonfly Books, Hong Kong, July 1965, p. 145.

¹³⁵ This capacity is 52.7 million acre-feet, almost double that of Hoover Dam in the United States. The dam was completed in 1962, but hydroelectric installation has been held up because of a lack of electrical generating equipment, and, more recently, silting problems.

momentum with the impetus of the Great Leap Forward in 1958. Small projects were stressed, and the emphasis was on storage of water.

Following the formation of communes, a more balanced approach toward water conservation was adopted, but greater reliance was placed on local resources.¹³⁶ That is, local needs became the guiding factor and limited capital enforced labor intensive projects. This accounts, in part, for the shift in 1959 to the digging of canals and construction of fewer but larger reservoirs from natural material—to fight the drought in the north and to bring these types of projects up to the level of wells, ponds, and small reservoirs, which had received the major emphasis during the 3 previous years.

Beginning in 1959—with an apparent slowdown of new construction—peasants were directed to concentrate on “improving” the area under irrigation. During the ensuing period to 1963 the water conservancy program was confined mostly to consolidating existing projects by building auxiliary works and other improvements. Such direction was necessary following the reckless pace of construction during the Great Leap Forward when as many as 100 million persons were engaged at one time in conservancy projects.^{137 138} In 1964, efficiency of irrigation through good management of existing systems rather than starting, new, large-scale and capital-intensive projects was the guideline. There is little evidence of new construction in recent years. Increased emphasis has been given to improving the existing system. Drainage of fields subject to waterlogging in North China and the increased use of electric pumps in the hilly sections in the southern part of the country together with the drilling of deep wells in pasture areas have received major attention. Reports indicate that numerous problems are being encountered because of silting of waterways and reservoirs in the north. It has been known for some time that this problem was likely to be an eventual threat to the hydroelectric systems in the loess areas.

Tens of millions of people participated in the water conservancy projects including peasant farmers during the off season. Also members of the armed forces, students during vacation, large numbers of unemployed from cities, and prisoners are used in conservancy work. Work groups were organized and functioned in a quasi-military fashion. Although work on projects was continuous, the peak periods occurred during the seasons of least farm activity when about 80 percent of the annual tasks were completed.¹³⁹ From official reports, an estimated 50 billion man-days were expended in water conservancy between 1949 and the end of the peak labor period in early 1960.

Many laborers on the projects were paid in goods. Others were paid wages of varying amounts and some “volunteer” groups donated their labor in addition to furnishing their own food and tools.¹⁴⁰ A rough estimate of worker’s compensation based on wages paid on the Huai River projects and projects in Kwangtung Province applied to estimated total work performed varies between 25 and 60 billion yuan

¹³⁶ *China Reconstructs* (English Edition), Peking, May 1959, p. 7.

¹³⁷ Reubens, *op. cit.*, p. 147.

¹³⁸ Most of the water conservancy work is accomplished during the off season which generally is from October to March.

¹³⁹ U.S. Department of Commerce, Joint Publication Research Service, *JPRS:157-D*, Feb. 5, 1960, p. 83.

¹⁴⁰ *Peking Review*, Oct. 21, 1958, p. 12.

(10 to 25 billion U.S. dollars). The Communist regime claimed that during the period 1949 to 1960 a total of 70 billion cubic meters of earthworks and masonry were completed, equivalent to excavating 960 Suez Canals.¹⁴¹

An assessment of the water conservancy program can be made only in general terms, because of a lack of data on the one hand and the mass of conflicting reports of successes and failures on the other. Claimed increases in irrigated land (5.35 million hectares) during the period 1949-52 increased the total irrigated area to around the pre-World War II level of about 20 million hectares. The regime claimed 34.3 million hectares of land under irrigation by the end of 1957.¹⁴²

Plans for the Second Five-Year Plan (1958-62) varied from adding 13.4 million hectares announced in December 1957 to 33.3 million hectares announced in February 1958 for a total of 66.6 million hectares by the end of 1962. (The new plan figure implied a revision of the claimed 34.3 hectares in 1957.) But fantastic things happened in 1958 including a claim that the irrigated area increased more than 32 million hectares, compared to a goal of only 2.9 million hectares for the year. China's total claimed irrigated area thus amounted to 66.7 million hectares by the end of 1958.¹⁴³ Mounting claims continued: 71.3 million hectares at the end of 1959,¹⁴⁴ and a vague report intimating that an additional 9 million hectares would be added in 1960, for a total of 80 million hectares under irrigation.¹⁴⁵

Not even the success-minded officials were able to live with these claims. T'an Chen-lin, Deputy Premier, clarified the irrigation situation somewhat in the *People's Daily* of June 3, 1959, by stating that only 46.7 million of the claimed 71.3 million hectares under irrigation met requirements stipulated in the agricultural development program, that is, ability to withstand a drought ranging from 30 to 70 days. In other words, less than 40 percent of the total claimed irrigated land had met the requirements of withstanding drought from 30 to 70 days. Thus, as much as 60 percent of the irrigated land could not withstand drought extending beyond 30 days. Premier Chou En-lai substantiated this view before the standing committee of the Second National People's Congress, August 16, 1959, when he stated that only 500 million mow (33.3 million hectares) could be adequately irrigated, that over 300 million mow could be partly irrigated, and that 200 million mow needed leveling of fields and digging of ditches before they could be benefited. Hwang Hu-chen, president of the Water Conservation and Hydro-Electric Power College said that only 500 million mow were guaranteed three irrigations a year, while there was no irrigation facility for the remaining 1.1 billion mow (73.3 million hectares).¹⁴⁶

The accomplishments of the water conservancy program leaves many unanswered questions but there can be little doubt that much was accomplished. In years of near normal weather conditions the new water projects have proved beneficial in regulating water flow and in extending the irrigated acreage. Nevertheless, in retrospect, the effect expended in dam construction, reservoir excavation, dike repair,

¹⁴¹ *Ten Great Years*, op. cit., p. 51.

¹⁴² *People's Daily*, Peking, June 3, 1958. One hectare equals 2.471 acres.

¹⁴³ *Ibid.*

¹⁴⁴ China News Agency, Peking, Oct. 28, 1959.

¹⁴⁵ Hsinhua News Agency, No. 780, Hong Kong, Feb. 21, 1960, p. 15.

¹⁴⁶ *China Youth Daily*, Peking, Mar. 14, 1963. One hectare equals 15 more.

and others has not basically altered traditional vulnerability to the scourges of flood and drought.¹⁴⁷

The testing period of the effectiveness of the water conservancy program occurred during 1959-61 when severe widespread drought centered in the northern provinces which accounted for nearly one-half of the irrigated area claimed since 1952. Yet those areas suffered most from the elements the irrigation projects were designed to alleviate. Many projects that were undertaken during the Great Leap Forward have been allowed to deteriorate. Some can never be used. Even the problem of getting water to the projects appears to have been of secondary consideration, and many projects were completed without a source of water. T'an Chen-lin, quoted above, continued:

In irrigation, the building of reservoirs itself does not mean that the irrigated acreage indicated in the construction figures has all actually received the benefits of irrigation. These benefits can only be obtained when the reservoirs are filled, canals and ditches are dug, the land is leveled off, and lifting equipment is at hand.¹⁴⁸

This statement forces a second look at the water conservancy claims and provides some reason for T'an's remark that 60 million hectares would be "fully benefited" by 1967, although at the time of the statement (Apr. 6, 1960) the regime was claiming that 71.3 million hectares were under irrigation.

If, as indicated by the regime, the main task of water conservancy was to alleviate the disasters of flood and drought and to insure a steady rise in agricultural production is taken at face value, it is evident that the Communist government over the past decade have been inadequate to the task. Although the amount of cropland which was taken out of production because of reservoirs, canals, ponds and other project-connected facilities is not known, it remains a debit factor in assessing the irrigation.

Fertilization

The use of chemical fertilizers in Mainland China's agriculture is of comparatively recent date. Prior to 1949, the major use of chemical fertilizer on the mainland was by the Japanese who built a 200,000-ton (annual capacity) factory at Dairen. In 1951, American-trained Chinese technicians constructed a factory at Nanking with a 50,000-ton capacity. These factories did not produce at full capacity. Dismantling of the Dairen factory after VJ Day and civil strife reduced production to a mere 27,000 tons in 1949.¹⁴⁹ Imports were negligible.

The traditional methods of fertilizing utilized manure from farm animals, human excreta, oilseed cakes, plant residues and ashes from fibrous material, mud from streams and bottoms of ponds, fish and animal refuse, gypsum and lime, and green manure, particularly from legumes. The latter has increased materially in recent years. Compost piles have always been an integral part of the rural scene. Officials estimate it requires 30 to 40 percent of farm labor to make, collect, and transport natural fertilizers.

The traditional fertilizers are still by far the most important source of plant nutrients. Despite efforts to increase these materials, how-

¹⁴⁷ Reubens, *op. cit.* p. 155.

¹⁴⁸ *New China News Agency*, Peking, Apr. 24, 1960.

¹⁴⁹ Jung-chao Liu, "Fertilizer Supply and Grain Production in Communist China," *Journal of Farm Economics*, vol. 47, No. 4, November 1965, p. 917.

ever, it was immediately apparent to government officials that a huge expansion in the production of fertilizer was necessary if the needed increases in agricultural production were to be attained. Thus, development of the chemical fertilizer industry was one of 4 major measures included in the regime's National Program for Agricultural Development (1956-67).¹⁵⁰ The development of the chemical fertilizer industry followed water conservancy according to government programming.

The general guidelines and goals for the production of natural and chemical fertilizers called for an average production of 1.5 to 2 hogs per rural family by 1962 and 2.5 to 3 head by 1967—for the production of manure to be combined with garbage and other plant materials, especially green manure crops—for making fertilizers. On the industrial side, 5 to 7 million tons of chemical fertilizers were to be produced by 1962 and 15 million tons by 1967.^{151 152} The production of chemical fertilizer made significant gains, but suffered numerous setbacks, particularly when the Soviet scientists were ordered home. According to available data, neither of the goals—hog production or chemical fertilizers—were attained in 1962, and the possibility of reaching the 1967 goals is even remote.

Soil deficiencies in Mainland China provided the guideline for production of chemical fertilizers. Nitrogen deficiency was by far the greatest with potash least. Despite the critical need for chemical fertilizers, China's chemical fertilizer industry developed slowly prior to 1953. The government claimed production of only 180,000 tons of ammonium sulfate, 7,486 tons of ammonium nitrate, and 6,000 tons of superphosphate by the end of 1952.¹⁵⁴ Soviet technicians and Soviet aid provided the base for the chemical fertilizer industry in the First Five-Year Plan, which called for the construction of five large plants and expanding the capacity of the two existing ones.¹⁵⁵ Construction was not started, however, until approval of the plan was given by the National People's Congress on July 30, 1955. Only one of the plants—in Kirin—began operation within the plan period. Through expansion of the older plants, however, and the construction of small ones, the industry reportedly was producing about 800,000 tons of chemical fertilizers in 1957.

With completion of the major plants started in the first plan, fertilizer producing capacity increased rapidly during the early part of the Second Five-Year Plan. A strenuous effort was made by the government during the Great Leap period to get local units to build small- and medium-sized plants to compliment the large state constructed one. Efforts to increase fertilizer production capacity is shown by budget allocations for fertilizer capacity expansion in the Second Five-Year Plan. It was 4 times the 375 million yuan allocated in the first plan period, and represented over 62 percent of total investments for the chemical industry.¹⁵⁶

¹⁵⁰ The other measures included water conservation, mechanization, and electrification.

¹⁵¹ Shortly after launching the Great Leap Forward officials predicted production of chemical fertilizer could reach 15-20 million tons by 1962 through a network of small and medium plants throughout the country.¹⁵³

¹⁵² China News Service, Peking, May 16, 1958.

¹⁵³ American Consulate General, Hong Kong, *Current Background* (Reprint of National Development Program, 1956-67), No. 781, February 14, 1966.

¹⁵⁴ *The Second Five-Year Plan Draft*, Peking, September 1956.

¹⁵⁵ First Five-Year Plan, *op. cit.*, p. 82.

¹⁵⁶ Ta Kung Pao, Peking, Jan. 27, 1958. Also, China News Service, Peking, Jan. 15, 1958.

Neither synthetic urea nor chemically refined potassium fertilizers were produced in China prior to 1958, since their production required more complicated equipment and production techniques than were available.¹⁵⁷ Experimental production of potassium began in 1958 at a small plant in Nanking. Fertilizers manufactured from other small plants included the more common ammonium chloride, ammonium cyanide, ammonium bicarbonate, and a few other ammonium solutions, most of which possessed a low nitrogen content.

The fertilizer industry suffered a temporary setback at the time of the departure of Soviet technicians, but a comparatively advanced degree of sophistication has developed since then with the import of plants from western countries and the hiring of western technicians to assemble and operate them. These activities have been accompanied by experimentations into the needs of fertilizers. According to American-trained Hou Te-pang, Vice Minister of China's chemical industry, experiments now show that a combination of about equal parts of nitrogen and phosphate obtained about a 50 percent higher response when applied to rice in south China.¹⁵⁹

One means of using phosphatic fertilizers to good advantage in the rice producing areas has been on green manure crops between rice crops. Not only does the green manure, especially legumes—milk vetch and cow vetch the most common in China—act as soil conditioners but also are nitrogen fixing plants. The use of green manure crops has expanded rapidly in the rice growing regions of the south in recent years. During the winter of 1965-66 the area reportedly was increased 50 percent.¹⁶⁰

Deficiency of phosphorus in the southern soils as revealed and likely by recent surveys those in the likelihood of similar deficiencies in provide an answer at least in part, for the rapid increase in manufacturing capacity of this fertilizer. The lack of adequate capacity to produce the requisite increased volume of sulphuric acid the main ingredient in manufacturing phosphatic may be a limiting factor in increasing this fertilizer at a more rapid rate. If subsequent surveys show the same phosphorus deficiencies in the northern as in the southern part of the country, China's requirements for phosphate fertilizer could amount to 15 to 20 million tons.¹⁶¹ Assuming a ratio of 1.1 with nitrogen fertilizers, total fertilizer needs for the country could surpass 30 million tons annually. This amount likely would go a long way in satisfying the nutrient deficiencies. In studies prior to 1949 it was estimated that 80 to 96 percent of the total cultivated land was deficient in nitrogen, 40 to 55 percent was low in phosphate and 15 to 24 percent lacked potash.¹⁶²

China's two-pronged attack to fill the demands for chemical fertilizers has resulted in a substantial increase in both production capacity

¹⁵⁷ In 1965, 9 varieties of phosphate fertilizers and 7 varieties of nitrogen fertilizers were being produced. They include: superphosphate, calcium magnesium phosphate, phosphate slag, ammoniated superphosphate, ammonium phosphate, nitric phosphate, triple superphosphate, precipitated superphosphate and calcium phosphate. Nitrogen fertilizers include urea, ammonium nitrate, ammonium sulfate, ammonium chloride, ammonium bicarbonate, ammonia water, and lime nitrogen.¹⁵⁸

¹⁵⁸ Hou Te-pang, *Wen Hui Pao*, Shanghai, Dec. 27, 1965.

¹⁵⁹ *Ibid.*

¹⁶⁰ There were indications that the green manure plantings would have to be curtailed during the 1966-67 winter crop period since food crops would have to be planted on the land to help make up losses in the 1966 grain harvest.

¹⁶¹ Hou Te-pang, *op. cit.*

¹⁶² M. Lamar, *The World Fertilizer Economy*, Stanford University Press.

and imports as shown in table 2. Whole plants have been purchased from abroad in addition to domestic construction of large, medium, and small plants, with the smaller plants producing mostly phosphate fertilizers. This sharp increase in both domestic production and imports are expected to continue. Negotiations for imports in 1967 about equal to those in 1966 already have been completed and a large British ammonia plant which is to support the urea plan from the Netherlands located near Luchow in Szechwan Province recently began production. Provisions were made to double the output of these plants in the future.

TABLE 2.—*Production and imports of chemical fertilizer, Mainland China, 1941, annual 1949-66*¹

[In thousands of metric tons]

Year	Total Nitrogenous	Phosphatic and other	Total	Imports all types	Total Availability
1941	227		227	(?)	(?)
1949	27		27	(?)	(?)
1950	70		70	(?)	(?)
1951	134		134	(?)	(?)
1952	188	6	194	239	433
1953	249		249	343	592
1954	321		321	579	900
1955	324	21	345	875	1,220
1956	563	100	663	837	1,500
1957	683	120	803	997	1,800
1958	900	344	1,244	1,456	2,700
1959	1,390	375	1,765	1,190	2,955
1960	1,960	500	2,460	860	3,320
1961	1,080	320	1,400	883	2,283
1962	1,600	500	2,100	1,000	3,100
1963	2,200	700	2,900	1,700	4,600
1964	2,600	900	3,500	1,030	4,530
1965	(4)	(4)	4,500	2,500	7,000
1966 ²	(4)	(4)	5,000	3,500	8,500

¹ These data, most of which are estimates, are based on sources in the U.S. Department of Agriculture.

² Not available.

³ Preliminary.

⁴ Included in totals.

Despite the rapid increase in the availability of chemical fertilizer, there has been little evidence of an increase in overall production of agricultural commodities. Major reasons are that not enough fertilizer is yet available to stimulate the necessary response plus problems of storage, distribution, and application by suspicious farmers who are slow to attempt new and progressive methods of crop cultivation. Low quality and types of fertilizer which deteriorates rapidly constitute a high proportion of the domestic production. Overriding these considerations has been an extended period of unfavorable weather which has cut heavily into production increases that could otherwise be attributed to increased application of fertilizer. The following tabulation (based on estimated available amounts for selected years in kilograms per acre, with nutrient values in parenthesis) indicates the small amount of chemical fertilizer available despite sharp increases in recent years:

Year	Arable land	Planted land
1952	1.6 (0.3)	1.2 (0.2)
1957	6.5 (1.3)	4.6 (0.9)
1962	11.7 (2.3)	8.0 (1.6)
1966	34.1 (6.8)	22.8 (4.6)

Agricultural Mechanization

Mechanization of agriculture in China refers primarily to the mechanization of cultivation in north and northeast China, mechanized irrigation and drainage in the southern paddy regions with limited cultivation, and the construction of wells in the major pasture areas. Chinese officials have estimated that about 100 million hectares can be eventually mechanized. This includes approximately 80 million hectares of land currently adaptable to mechanical operation and a potential 20 million hectares which are expected to be added through reclamation.¹⁶³ To accomplish mechanization officials estimated the utilization of 100 to 150 million horsepower divided among 1.2 million tractors (and complementary machinery), 300,000 to 350,000 combine harvesters and an equal number of trucks, and 3½ to 4 million power pumps. This amount of equipment would provide each 100 hectares (247 acres) with one tractor, a combine and one truck for each 300 hectares (741 acres) and a 5 horsepower pump for each 13.3 hectares (33 acres).¹⁶⁴

This was an overwhelming goal in sight of the scarcity of even the simple farming tools, their inferior quality, poor design, and short life.

For centuries ploughs, picks, hoes, spades, sickles, rakes, flails, winnowing shovels, and so on, have constituted China's farming tools. These were made from cast iron, wrought iron, and wood which were the main ingredients in simple ploughs and harrows of the one-horse type. Motive power was (and still is) furnished by oxen, cows, horses, mules, donkeys, and water buffalo in the south. Made by artisan families, the design of these tools had changed only slightly. Although peasants were aware of tractors (the first one was imported by China in 1907), they were familiar only with foreign makes until 1958 when China successfully began producing its own tractors.

Significant progress has been made in mechanizing farming operations in certain areas of China, but for the country as a whole only a start has been made. Mechanization in the Western sense has been confined largely to state farms, which exist primarily for reclaiming land, and state tractor stations which serve the larger farming units. Throughout the First Five-Year Plan, of the slightly fewer than 25,000 tractors imported about half were used in agriculture.¹⁶⁵ These units, distributed to 390 tractor stations provided motive power for about 4.5 million acres of land, or one tractor for 375 acres.¹⁶⁶ A major problem which grew out of the imported machinery was that of unstandardized equipment and a serious shortage of spare parts. These drawbacks seriously interfered with the hoped for progress of the initial thrust of mechanization.

Mechanization did not become a serious program until the beginning of the Second Five-Year Plan when producing capacity expanded sufficiently within the country to enable commercial production of serial designs. The original plan (including mechanization of agricultural, forestry, animal husbandry, and sideline production) was to be completed in about 10 years.¹⁶⁷ A Ministry of Agricultural Ma-

¹⁶³ *People's Daily*, Peking, Dec. 22, 1962.

¹⁶⁴ *Far Eastern Economic Review*, vol. 39, No. 6, Feb. 7, 1963, p. 239.

¹⁶⁵ *Ibid.*, No. 7, Feb. 14, 1963, p. 309.

¹⁶⁶ Nung-veh Chi-hsien (*Agricultural Machinery*), Peking, No. 18, 1959, pp. 1-5.

¹⁶⁷ Hung Ch'1 (*Red Flag*), No. 4, 1960, pp. 4-10.

chine Building Industry was established in 1959. This agency claimed in 1959 to have in operation 59,000 tractors. The Ministry also claimed to have in operation 4,900 combine-harvesters and 7,500 motor threshers and almost 3.4 million horsepower of mechanical equipment for irrigation and drainage work.¹⁶⁸

The Great Leap that occurred in both production and imports of tractors more than doubled the number by the end of 1962 (100,000) compared with 1958.¹⁶⁹ The proportion of this increase produced domestically is not known, but it likely was comparatively small because of the lack of raw materials, particularly the various required types of steel. Even after China began producing its own tractors, it was necessary to import most of the 450 kinds of metal from which the roughly 10,000 parts of the "East In Red" tractor was made.¹⁷⁰ As late as 1962, China was not producing all the metals necessary to manufacture its farm machinery. Of the metals domestically produced many were of inferior quality.

As the production capacity increased cutbacks occurred in the importation of tractors. The limited ability of native technicians to repair the large variety of foreign makes of tractors and other internal combustion engines was further reduced by a lack of spare parts. In six production brigades a visitor found eight models of engines consuming different fuels—gasoline, natural gas, and so on—and in one of the districts in Chekiang Province more than 40 types of power-driven machines were used for irrigation and drainage.¹⁷¹ In 1961 as many as 20 percent of the tractors and 20 to 30 percent of the machines used in irrigation were idle because of a lack of repairs and spare parts.¹⁷² Furthermore, despite much consolidation of farm plots following collectivization and communalization, it was difficult in many areas to join enough contiguous plots together into sufficiently large farming units to qualify for tractors under the prevailing regulations.¹⁷³ Also, in many paddy rice areas, roads and bridges were too narrow and bridges were not strong enough to support the heavy tractors.

Mechanization of agriculture has been fraught with numerous problems including intra-Party differences as to the types of machines and the speed with which mechanization should be pushed. The most recent policy was outlined in the *People's Daily*, April 9, 1966. The announcement called for achievement of mechanization of agriculture on a national scale within 15 years. More emphasis appeared to be on mechanization than on semimechanization, which received major emphasis in 1964 and 1965.¹⁷⁵ The brigade and commune were cited as the units to implement mechanization. Amid the sober announcement was the flamboyant "revolutionary flying leap" which agricultural production would be enabled to achieve with mechanization. The

¹⁶⁸ *Ibid.*

¹⁶⁹ *People's Daily*, Peking, Nov. 9, 1962, pp. 1-2.

¹⁷⁰ *Ibid.*, Dec. 18, 1962, p. 2.

¹⁷¹ *Ibid.*, Dec. 18, 1962, p. 2.

¹⁷² Leslie T. C. Kuo, "Agricultural Mechanization in Communist China," *The China Quarterly*, January-March 1964, p. 140.

¹⁷³ In Pingku hsien in Peking municipality regulations required that land of less than 10 mou (1.7 acres) or less than 165 yards in length was not suited for caterpillar tractors and that areas less than 5 mou (0.85 acre) or less than 110 yards did not qualify for wheel tractors.¹⁷⁴

¹⁷⁴ *People's Daily*, Peking, Dec. 8, 1962, p. 2.

¹⁷⁵ Semimechanization refers to improved handtools, animal-drawn implements, and small hand-type engine-driven machines.

announcement, however, followed the basic policy lines with heavy stress on gradualism, self-reliance, local investment, unsophisticated equipment, and a balance between mechanization and other inputs.

Farming implements currently produced besides include traditional handtools, animal-drawn implements such as the hand plow, single-row cotton planter, multitooth hoeing machine, seven-row wheat-sowing machine, manual- and power-operated corn thresher, and heavier machinery for use by tractors. Six standard tractors, products of domestic industry, were in use ranging from the (Worker Farmer) 7 horsepower hand tractor for use in rice paddies to the large 100 horsepower (Red Flag) caterpillar track tractor used by state farms in reclamation projects. The type of machines and tractors being produced are continually being modified to fulfill demands of local cultivation conditions. Factories are dispersed to cut transportation costs and to utilize local materials and labor.^{176 177}

The extent of mechanization at the present time, the prospect of attaining the goals and the success with which the regime is attaining these goals is difficult to assess. Some evidences of a successful speed-up in manufacturing farm implements and in organizing the industry to better serve the agricultural areas can be drawn from official reports. Local industries have been given the responsibility of producing all semimechanized and mechanized farm tools and all motor-driven machines generating 20 horsepower and less.¹⁷⁸ New tractors designed for the ricegrowing areas have been modified for use in dry crop areas as well. Small motor driven sprayers, high-lift pumps, and small portable diesel and gasoline have grown in prominence in the last year or so. The increase in mechanization is uneven, however. Communes and brigades must purchase their own equipment, and reports indicate that some brigades have fully mechanized their agricultural operations, while others have barely begun.¹⁷⁹ Reports from China's largest grain producing province, *Szechwan*, suggest that typical implements utilized in farm production are foot-pedaled threshers, hand-propelled corn shellers, and hand-operated potato slicing machines.¹⁸⁰

A series of emergency measures were taken in 1962 to find a solution to the problem of farm mechanization. The Ministry of Agricultural Machine Building Industry was aided by the Chinese Academy of Agricultural Mechanization, which was designated to provide guidance and develop farm machinery models and help advance the adaptation of mechanization in different regions at a uniform speed based on prevailing crops and other local conditions.¹⁸¹ In 1965 it was reported that there were 2,263 mechanical stations in over 1,300 hsien and municipalities with about 135,000 tractors (15 horsepower units) in 1965.¹⁸² If these figures are correct, they represent a net gain of about 35,000 tractors since 1962, a significant gain considering that most of this increase was the result of indigenous production and that the replacement of wornout imported tractors had to be replaced.

¹⁷⁶ U.S. Department of Commerce, *op. cit.*, *JPRS*: 33,457, Dec. 22, 1965, pp. 1-25.

¹⁷⁷ *Far Eastern Economic Review*, *op. cit.*, Feb. 3, 1966, pp. 153-155.

¹⁷⁸ New China News Agency, Peking, Oct. 17, 1966.

¹⁷⁹ New China News Agency, Tiayuan, Oct. 20, 1966.

¹⁸⁰ New China News Agency, Chengtun, Oct. 24, 1966.

¹⁸¹ *People's Daily*, Peking, Dec. 22, 1962, p. 5.

¹⁸² *Ibid.*, Apr. 13, 1966.

On the other hand, it represents an extremely weak effort toward attaining the goal of 1.2 million tractors (15 horsepower units) not in 20 to 25 years, but in 15 years according to Mao's newest estimate.

Other Agricultural Inputs

The First Five-Year Plan called for reclamation of 2.6 million hectares (6.4 million acres) of land. Much of the initial thrust of reclamation consisted in reactivating farms that had been abandoned during the civil strife prior to 1959. The plan for reclamation was expanded in 1956 to a goal of 6.7 million hectares (16.6 million acres) by 1967.¹⁸³ The usual conflicting reports showed overwhelming success—5.3 million hectares (13.1 million acres) reclaimed during 1953–57. This figure was later reduced to 3.9 million hectares (9.6 million acres) in the State Statistical Bureau's report on the First Five-Year Plan.¹⁸⁴ This addition boosted the total cultivated area from the claimed 107.9 million hectares (266.6 million acres) in 1952 to 111.8 million hectares (276.3 million acres) in 1957, according to official statistics, and increased the double cropping index to 141.¹⁸⁵

A high percentage of the land reclaimed during 1953–57 was in areas of marginal agricultural production, and some was in the mountainous areas adjacent to the southern boundary of Outer Mongolia in the Sunkiang-Liaoning Plain, extending east to west from Heluukiang Province to western Singiang Province.¹⁸⁶ In addition to land reclamation, a land consolidation program was carried out in connection with the collectivization of agriculture. How much cultivated land was added through the consolidation of small farm is not known; but likely it was not significant because field boundaries, banks, paths, and roads had already been reduced to a minimum prior to the collectivization drive. On the other hand, some of the farmland was taken for industrial and urban sites, farm building sites, extension of roads, and construction of irrigation facilities. Undisclosed amounts of cultivated land were lost to erosion and some was abandoned due to a loss of fertility.¹⁸⁷ According to official reports, reclamation was very expensive compared with returns. In 1956, the regime reduced the original estimate of the potential for reclamation from 100 million hectares (247 million acres) to 43 million hectares (106 million acres). This was more in line with the Nationalist government's estimate prior to World War II.¹⁸⁸ The preoccupation with communes in 1958 diverted much of Peking's attention from reclamation as a means of solving the productive land problem of China.

Sketchy reports indicate that reclamation in 1959–61 amounted primarily to an attempt to reclaim the land which was deserted during the Great Leap Forward. No indication of success is available. Official statistics indicate that since 1957 there has been a decline in the amount of cultivated land. As late as 1966 officials carried the area of cultivated land as 1.6 billion mow (106.67 million hectares)¹⁸⁹ which

¹⁸³ *Issues and Studies* (Institute of International Relations, Republic of China), Taipei, November 1965, p. 18.

¹⁸⁴ New China News Agency, Peking, Apr. 14, 1959.

¹⁸⁵ The multiple cropping index is the ratio of sown area each year to the amount of cultivated land.

¹⁸⁶ *Issues and Studies, op. cit.*

¹⁸⁷ *Chinese Communist Problems* (Institute of International Relations), Taipei, August 1963, pp. 12–13.

¹⁸⁸ *Issues and Studies, op. cit.*, November 1965, p. 18.

¹⁸⁹ Equal to 263.6 million acres.

is a reduction of 4.6 percent from the peak of 111.8 million hectares (276.3 million acres) in 1957. The difference in the amount of land in official statistics, 5.13 million hectares (12.7 million acres) may be the amount of land which was allocated to private plots, or it may represent a total loss to irrigation projects, roads, industrial sites, and so on, or a combination of the two. Although the multiple cropping index has increased somewhat, it is unlikely that the total sown acreage per year has regained the level of 1957.¹⁹⁰

Although some progress is being made in crop breeding and in the control of insects and plant disease, not much information is available on the effectiveness of such programs. A major limitation is the relatively small number of trained agricultural scientists and technicians. Major programs in crop improvement have been confined mainly to seed selection and propagation. Developmental work has been carried out on hybrid corn and kaoliang and possibly other crops. From the limited yield and production data available, it is difficult to attach much significance to advancements in crop development. China's crops are afflicted with pests and diseases similar to those in other countries of the Far East. Control measures are being developed and modern equipment for applying insecticides and herbicides appear to be in serial production, but progress has been slow in light of the large amount of equipment needed by such a large country. Pest control has been carried out mainly through cooperative effort of the peasants using simple methods.

Losses from insects, diseases, destructive birds, and small animals probably are serious. Prewar estimates of damage from insects alone was estimated at 12 million tons of cereals each year.¹⁹¹ Nationwide networks have been set up to provide information and forecasts on insects, pests and crop diseases. Serious outbreaks of wheat rust in north China in the spring of 1964, damage by locusts in central China in 1965, and the outbreak of cutworms in north and northeast China and attacks by other pests in both north and south China in 1966¹⁹² indicate weaknesses in the control mechanism. Reports indicate that in some areas peasants were forced to revert to more primitive methods of control after their supply of chemical insecticides had been exhausted.¹⁹³

Another important factor, the institutional nature of Communist control of the agricultural sector, has played a dominant role in shaping the character of the country's agriculture. The vacillation from centralized to decentralized control through the socialization process—previously discussed—¹⁹⁴ to the present loosely defined socialist unit has destroyed the base for understanding between the peasant and the rulers. The various forms of control and their effects

¹⁹⁰ Numerous official press statements during recent years reveal less total cultivated land in a number of provinces. Although data are not yet sufficient, they may show eventually that the decrease is due to statistical adjustments.

¹⁹¹ Hughes H. Spurlock, "Communist China's Agriculture," *Foreign Agricultural Economic Report*, No. 115, U.S. Department of Agriculture, Economic Research Service, October, 1959.

¹⁹² New China News Agency, Peking, Dec. 27, 1966.

¹⁹³ For a more detailed treatise in technological advancement in China's agriculture see "Agricultural Science" by Ralph W. Phillips and Leslie T. C. Kuo, U.S. Department of Agriculture, Washington, D.C., reprinted from *Science in Communist China*, American Association for the Advancement of Science, 1961.

¹⁹⁴ See collectivization of agriculture, p. 215 above.

on agricultural production have been ably treated by Dwight H. Perkins.¹⁹⁵ Perkins points out that under the centralization of the communes the use of labor became more flexible but that the cadres were not sufficiently skilled or were too doctrinaire to utilize this added resource efficiently and that peasants' incentives (and consequently their output) declined as they became more removed from their connection with the land and that these problems increased with the size of the controlling unit. He concludes:

... there appears to be little that centralization accomplishes which cannot be done better through extension services, taxes, and market controls in the context of a free peasant economy. In Communist China, however, political and ideological considerations cannot be put aside. The political and ideological advantages to the regime of the collective form of organization in agriculture have been too great for this organization to be abandoned except under the most desperate circumstances. The real question for China, therefore, is not whether cooperatives (collectives) or communes work better than a free peasant alternative, but whether they can be made to work at all.

The radical economic convulsions that accompanied China's Great Leap Forward likely would reappear if another such Leap were attempted. To reinstate a new Leap Forward would require a return to greater centralization by the Communist Party, resulting in the denial of peasants' gains since 1960. The Chinese peasantry was not ready for the first Leap Forward episode, and, despite the socialist education movement, the cultural revolution, and other programs aimed at "uniting" the peasants into armies of workers for the state, they remained unmoved and passive to the drumbeat of the Communist Party. The Party's tampering with the peasant's soul has not wrested it from the soil nor its attachment to basic Chinese culture. The Communists will find this a difficult gap to bridge in their attempt to create the "new man" with the selfless oriented desire to place the collective, the party, the people, and the nation above self.

AGRICULTURAL PRODUCTION UNDER THE COMMUNISTS

China's agriculture has the triple duty of producing food and fiber for a rapidly expanding population, providing raw materials for an expanding consumer industry and of supplying a large share of the country's exports. Agriculture thus greatly affects the performance of all other sectors of the economy directly or indirectly; mostly it has a direct effect on the level of living of the population. It provides a livelihood for about 80 percent of the population. In 1957 it contributed about 50 percent of the national income, and, although this proportion has declined somewhat in relative terms because of the increase in the value of the industrial and other sectors of the economy, it nevertheless ranks among the top contributors to the national product. In 1965 almost 70 percent of the country's exports were

¹⁹⁵ See Dwight H. Perkins' "Centralization and Decentralization in Mainland China's Agriculture, 1949-62," *Quarterly Journal of Economics*, vol. 78, No. 2, May 1964, pp. 208-237.

either farm products or manufactured goods made from agricultural raw materials.¹⁹⁶

Mounting difficulties have been encountered in attempting to increase the productive capacity of agriculture. But substantial increases in production are necessary if the economy is to expand and if the population is to receive an adequate diet. Historically, China's agriculture has remained at about a break-even level: expanding slightly in times of favorable harvests and retracting in years of poor harvests. Even with the major efforts during recent years to increase yields, as indicated in the sections above, there has been no easing of the pressure on agriculture to produce. Production has stagnated and serious problems now confront agricultural planners. A few years of more favorable weather could result in substantial increases in farm production due to added inputs and efforts by peasants during the off season to increase agriculture's production capacity. Crop production has been pushed about as far as traditional practices and methods will permit, and increased farm output can be attained only through the adoption of new technology, increased inputs and improved practices. The "agricultural first" policy inaugurated in 1961 may be an indication that Government officials recognized this need. A major question remains, however. Will the regime be willing to allocate the time and means whereby these factors can be applied to the extent necessary to accomplish the goals?

Mainland China ranks among the world's largest producers of food. Grain crops are by far the most important. In 1957, these crops occupied 70 percent of the total sown area according to official data.¹⁹⁷ Agricultural production is necessarily intensive and is concentrated on those crops which have a high energy output. Because of this high man-land ratio, the production of livestock is of secondary importance and is justified more on what it offers as an input to production of crops than what it offers in terms of food.

Historically, China's food production has been at a level about sufficient to satisfy the country's needs but at a low level of consumption. At various periods prior to 1949, the country found it necessary to import agricultural products to satisfy domestic needs. During the rule of the present regime up through 1960, the country was a net exporter of farm products, at the expense of consumption. Beginning in 1961, the country became a net importer of agricultural commodities, primarily grains. It was not until 1965 that exports of agricultural commodities exceeded imports of grain, which have continued at a high level and at an expanding rate, to bolster domestic production which has fared poorly in the decade of the 1960's.

Major Crops

China's major important crops are rice, wheat, soybeans, and cotton. Rice is the staple food of the south and wheat that of the north. Soybeans produced throughout a wide area of the country, add a signif-

¹⁹⁶ The development of light industry has encouraged a sharp increase in the exportation of semimanufactured and finished goods, while at the same time providing more opportunities for the expanding labor force.

¹⁹⁷ If to this is added potatoes which are treated as a cereal crop in Chinese grain statistics, the amount of land in cereal production was almost 77 percent. ¹⁹⁸ This proportion has declined somewhat since then.

¹⁹⁸ *Ten Great Years, op. cit.*, pp. 114-120.

icant proportion of fats and protein. Their importance as the chief export crop has declined significantly since 1960. Sweetpotatoes have increased materially in the south as a supplement to rice and are the chief food in the diet among low income groups. Millets and kaoliang are chief substitutes for wheat in the north. Corn, which has one of the broader ranges of production has become increasingly important. Cotton ranks as the most important raw material of agricultural origin. Compared with crop production elsewhere in the world, China is the leading world producer of rice, millet, and sweetpotatoes; it ranks second in the production of soybeans, sorghum (kaoliang), tobacco, and barley; it ranks third in corn and cotton and is fourth in the production of wheat.

*Areas of Crop Production*¹⁹⁹

The cropping areas can be divided into two broad regions, namely wheat and rice, with the Yangtze River roughly as the dividing line. Rice is the outstanding crop south of the river, and wheat is the most important crop grown to the north. Some wheat, however, is grown in every province south of the Yangtze and some rice in almost every province to the north. Within these two regions a large variety of crops are grown—some crops because of their natural characteristics and others because of their adaptability to the rotation and associated characteristics related to intensive cultivation. Based on these characteristics the following cropping patterns have emerged as shown in the accompanying chart, with only slight but undefined variations under Communist rule:

1. Double Cropping Rice Area.—Located in the extreme southern part of the country and comprising Kwangtung, southern Kiangsi and southern Eukien Provinces, this area of intensive cultivation is made up of river deltas, undulating mountain ridges and terraced hills. Although the area actually cultivated is small, a large part is irrigated. Rice is grown where water is available. Two complete crops of rice per year can be grown with a third crop in between during the winter, such as vegetables, wheat, barley, beans, and peas, or the land may lie fallow. Sugarcane has become an important crop in this area in recent years. On the upper, drier areas—not suitable for rice—numerous summer crops including sweetpotatoes, peanuts, and soybeans, are common with corn and millet grown at higher elevations. Winter crops which are rotated with rice also may be grown in the lower areas of the upland cropping. Subtropical fruits and mulberry trees for silk worm production also are important. Principal fruits include oranges, pomeloes, lychee, persimmons, and bananas. Other, less important fruits, are mangoes, peaches, kumquats, pomegranates and pineapples.

2. Rice-Tea Area.—This area comprises most of Hunan, Kiangsi, Chekiang, and northern Fukien and southern Anhwei Provinces. Some land areas are interspersed in the predominantly undulating mountain ridges and foot hills with elevations generally lower than 1,000 meters (3,280 feet). Tea is grown extensively in the hilly areas, with rice, the main crop, on the level areas and on hillsides where water is available to terraced fields. Through a system of interplanting late rice with early rice 3 crops of rice are possible in a 2-year rotation.

¹⁹⁹ For a fuller description on areas of crop production see: T. H. Shen, *op. cit.*, pp. 132-140, and John Lossing Buck's *Land-Utilization in China*, 1937, pp. 21-91.

Early rice planted in April–May in wider rows is interplanted with late rice in June–July and harvested in August when the late rice is half grown. A single rice crop per year also is common. Other summer crops grown in the area include cotton, tobacco, and sugarcane. Principal crops grown during the winter on both rice land and upland are wheat, barley, broadbeans, peas, and in some districts, rapeseed.

3. Southwestern Rice Area.—Containing the smallest amount of cultivated land of any important crop area in China, this area comprising Yunn and Kweichow Provinces and the northwestern part of Kwangsi, is characterized by high intersected plateaus. Valleys are narrow and crop production is restricted. Rice is the principal crop where level land and water are available, followed by such summer crops as rice, soybeans, millet, haoliang, peanuts, tobacco, sweetpotatoes, and small amounts of cotton. Fruits are not grown on a commercial scale, but tung oil trees are important. Opium poppies formerly were grown extensively in this area.

4. Yangtze Rice and Wheat Area.—Bordered on the south by the Yangtze River, this area—including most of Hupeh, central Anhwei, and most of Kiangsu Provinces—has a very high percentage of cultivated land, and is blessed with favored growing weather. Two crops (generally rice) can be produced per year on most of the area. The Yangtze Delta which forms a large portion of Kiangsu Province is especially adaptable to rice, which is considered the major crop although the northern boundary is the northern limit for rice. Wheat also is important. Neither of these crops compete for the same land, since wheat is a winter crop. Other crops after rice include soybeans, cotton, and sweetpotatoes. Other winter crops are barley, broadbeans, rapeseed.

5. Szechwan Rice Area.—Szechwan Province, the most important grain-producing province in China, together with western Hupeh and southern Shensi Provinces constitute this area. The extreme variations in topography and climate, from subtropical to temperate, accommodate a wide range of crops of which rice is the most important, occupying over 80 percent of the cultivated land, and is grown extensively in irrigated areas—even in terraced areas on low mountain ranges. Other summer crops include corn, sweetpotatoes, peanuts, and kaoliang (sorghum), cotton, millet, and tobacco are common in some districts. Winter crops such as broadbeans and rapeseed can be grown on about half the cultivated land. With the reduction of opium acreage, tung oil has reportedly become the most important cash crop.

6. Winter Wheat and Kaoliang Area.—The high percentage of cultivated land in this area, which includes all of Shantung and the eastern parts of Honan and Hupeh Provinces, makes this area one of the most important diversified crop areas of China. Uncertain and uneven distribution of rainfall is the major limiting factor on production throughout most of this level plain which rises at most only about 50 meters above sea level. Winter wheat is the most important crop, but barley and peas are grown in many districts. Of a large variety of summer crops kaoliang is the most important, supplying not only food but also stalks for fuel. Soybeans are extensively grown, usually as a separate crop but may be interplanted with kaoliang, millet, and corn. Millet is the third ranked crop and is followed by corn and

sweetpotatoes. Cotton is important in some districts. Peanut production is significant in Shantung and Honan and Flue-cured tobacco in a few localities. A large variety of fruits and walnuts are grown extensively, of which pears, apricots, persimmons, and apples are important.

7. Winter Wheat-Millet Area.—Shansi, Shensi, eastern Kansu and western Hunan comprise this region, located in the mountainous area of the great bend of the Yellow River. Rainfall is unreliable and cropping is confined to the valley areas and along the Yellow River in southern Shansi, northern Honan, and southern Shensi. Winter wheat is the main crop followed by rapeseed, peas, and barley. Summer crops include millet, the most widely grown crop, followed by corn, kaoliang, soybeans, sesame and buckwheat with cotton important in some of the better agricultural areas. Summer and winter crops are not grown on the same land the same year because of the short growing season.

8. Soybean-Kaoliang Area.—Known formerly as Manchuria and comprising Liaoning, Kirin, and Heilungkiang Provinces, this area produces an array of summer grown crops, many varieties of which have been adapted to the peculiarities of the area in which they are produced. Kaoliang and soybeans predominate. Several varieties of each make it possible for their production throughout most of the area. To the south in valleys, if rainfall permits, corn and rice are important in Liaoning and Kirin. Cotton, sugarbeets and Flue-cured tobacco also are important in these provinces, particularly in the Manchurian Plain. Further north spring wheat is a significant crop as are millet, flax, hemp, and perella seed. Irish potatoes are common throughout the area. Further north, primarily in Heilungkiang, with many areas having only 130 frost-free days, fast maturing crops such as spring wheat, barley, rye, oats, buckwheat, millet, and beans are grown.

9. Spring Wheat Area.—This area includes a large area in southeastern Inner Mongolia, eastern Kansu, and northern parts of Shensi, Shansi, and Hopeh and eastern Liaoning. It is an area of extensive agriculture. Its colder climate, higher elevations, and limited rainfall limit the area of cultivated land. Spring wheat is the principal crop followed by millet, oats, peas, flax, and buckwheat. Crop land gradually thins to expanses of grazing land to the north and west of this area.

10. Other Areas.—Except for limited farming in the oases areas of western Sinkiang, some irrigated areas in the northern part of Sinkiang's Tarim Basin along the Tarim River, and limited production of crops in Tibet the remainder of the vast area west of the 100th meridian has little agricultural significance except as grazing areas for livestock. Considerable effort is being expended by the Government to develop agriculture in these areas. Sinkiang shows the most promise, but the potential is limited due to a lack of rainfall and the limited potential for increasing the irrigated area. Probably about 1 percent of the land in Sinkiang is cultivated with a tolerably large variety of crops raised on irrigated land. They include cotton, wheat, millet, corn, potatoes, barley, oats, melons, fruits, and even rice in certain areas. Tibet is primarily nomadic-pastoral. Only in limited

areas are crops grown and they constitute varieties of fast maturing barley and some wheat.

Agricultural Output

The lack of official data since 1958 and the relatively unreliability of official data prior to that time prevent an accurate analysis of China's agricultural production. However, official reports of plan fulfillments, weather conditions, policy changes, the flow and balance of foreign trade and so on provides a basis for rough estimates of the current situation and trends. The following analysis is based on the accumulation of available data and on published and unpublished estimates by various agencies of the U.S. Department of Agriculture.²⁰⁰

Agricultural production under Communist leadership has been sporadic. The greatest advancement in production under the Communists occurred during the decade of the 1950's. Because of World War II action and that of the civil war which followed, agricultural production had reached a very low level. It is generally accepted that by the start of the First Five-Year Plan the production level of agriculture had about regained the prewar level. Then followed a few years of rapid expansion through 1955 for most crops and livestock according to official statistics.²⁰¹ Official statistics show that the four major categories of cereal crops (wheat, rice, miscellaneous grain,²⁰² and sweetpotatoes)²⁰³ and other food crops (vegetables, soybeans, fruits, peanuts, etc.) increased in the aggregate by almost 20 percent from 1952 to 1957 and that population increased by about 11 percent. This would represent about a 9-percent increase in per capita production, or an annual rate of about 1.5 percent a year.²⁰⁴

Although these data place the results of the First Five-Year Plan in a favorable light, closer examination reveals that the real increase in crop production and also livestock production occurred between 1952 and the completion of the massive collectivization drive in 1955-56. By the time the collectivization drive culminated in 1957—with the consolidation of the higher level types of collectives—stagnation in agricultural production had already commenced. Had it not been for the exceptional good years 1956 and 1958 when favorable weather boosted crop production significantly, the decline, which became obvious in 1959, may have been worse.²⁰⁵ Although smaller increases in grains, cotton, tobacco, and tea were recorded up through 1957, production of soybeans, peanuts, rapeseed, and sesame declined between 1955 and 1957. Although a general decline had occurred in the number of cattle, horses, donkeys, and mules in 1957, numbers of all livestock increased

²⁰⁰ Because many estimates have not been fully tested and because additional information justifies frequent revisions, publication of estimates is necessarily limited.

²⁰¹ Some of this expansion was statistical but the extent is undetermined.

²⁰² Miscellaneous grains is a category including corn, barley, oats, buckwheat, kaoliang (sorghum), millet, field peas and dry beans.

²⁰³ The area planted to sweetpotatoes increased more rapidly than any other crop. They could be grown under adverse weather conditions and yielded a high caloric return.

²⁰⁴ See also a similar analysis by Helen Yin and Y. C. Yin, *Economic Statistics of Mainland China, 1949-57* (Cambridge: Harvard University Press, 1960), pp. 3-30, and Alexander Eckstein, "Communist China's Economic Growth and Foreign Trade, 1966" (Council on Foreign Relations: McGraw-Hill, New York), pp. 58-59.

²⁰⁵ The claimed 185 million tons of grains (including potatoes) produced in 1957 is questionable. Weather was less favorable compared with 1956, and 1957 was the first year that soybeans were not included in the grain totals. Also reporting of statistics at most levels began reflecting the expansionist tendencies of the "Great Leap Forward" which soon followed. The exaggerated reporting on the number of hogs in 1957 is a good example.

between 1952 and 1957. Sheep and goats had the most consistent gains, whereas hog numbers varied greatly particularly in 1957 when unbelievable inventories were published.²⁰⁶

Despite the low level of increase in production during this period, the export share of food crops and soybeans remained fairly stable and at a fairly high level, although mainland newspapers and periodicals complained of food shortages and tight rations, particularly in the cities. This condition may have arisen due to little or no change in government procurement, while, at the same time, there was a decided increase in urban population. The collectivization of agriculture, which was to consolidate the regimes' control of both production and distribution of agricultural products, failed in both instances and likely was a major factor in the decline in the urban food supply.²⁰⁷

There was no appreciable increase in the production of other major food crops during the 1952-57 period. Some increases occurred in the production of fruits and vegetables on private plots but vegetable oil-seeds, which provide a substantial source of fats in the diet, remained static; peanut production increased slightly but soybeans declined slightly. Cotton production was pushed under special programs in an attempt to make China self-sufficient and to accommodate the establishment of a huge light industrial complex with the textile industry as the base. Production of cotton increased substantially during the earlier years of the First Five-Year Plan but ran into competition with grain crops when it became necessary to expand the area of grains when increased yields failed to materialize. Thus, during the period of the First Five-Year Plan production in the agricultural sector responded favorably to the initial inputs, and the peasants took a keen interest in their status as new landowners. By the end of the plan period too little investment, too much central control, and too little personal incentive had taken their toll. Traditional patterns of farming were changed, the delicate balance of soil fertility had been impaired, traditional rotation and the complex interplanting systems had given way to a central plan, shortages of draft power and farm tools began to mount, and finally the peasant, the regime's greatest input became disillusioned and apathetic.

Despite these drawbacks the year 1958 provided agriculture with its best year ever. However, disruptions of the farming system caused by collectivization were multiplied by the chaos which accompanied the emergence of the communal system during which time it appears that both the regime and the peasant lost contact with reality. Excessive destruction of livestock occurred, and considerable waste of foods, which unwittingly were in shorter supply than at first anticipated, occurred as centralized feeding became an integral part of communal living. The onslaught of 3 years of unfavorable weather on top of the administrative fiasco of the Great Leap Forward reduced agricultural production to a crisis level, forced the importation of grains to supplement dwindling stocks, brought about a new "agricultural first" policy and returned a certain amount of autonomy to local production units.

²⁰⁶ Official information on the number of hogs is baffling. Although the inventory date was extended from June 1956 to the end of December 1957, the increase of about 65 million hogs compared with a large net loss in inventory between 1954 and 1956 is completely unreasonable in light of reported heavy slaughtering of hogs by peasants rather than turn them over to the collective.

²⁰⁷ Eckstein, *op. cit.*, p. 59.

Agricultural production has not responded as hoped by the regime despite the efforts in irrigation, fertilization, mechanization, seed selection and development, and disease and insect control and other inputs. Adjustments are still being made but the combination of administration, peasant motivation, and modernization programs now underway have not solved China's food problem. Under the handicap of limited acreage expansion for crops,²⁰⁸ attention and capital have been concentrated on the more promising areas that respond to intensive cultivation.

Since the drastic reduction in food crop acreage in 1959, only the estimated acreage of miscellaneous grains presently exceeds the 1957-58 level; the acreage of wheat has remained significantly below that level; and the acreage of rice has not regained the 1957-58 level. Acreage of potatoes surpassed the 1957-58 level in the early 1960's but has declined during the past 3 years. Yields of rice are at their highest level and exceed those for 1957-58, whereas those for wheat, miscellaneous grains, and potatoes remain significantly less. This has been due primarily to the serious drought conditions in the major wheat and miscellaneous grain area of north China during the past 2 years and possibly to a shift of some potatoes to more marginal land. Total production of these crops, therefore, has not regained the 1957-58 level. Of the individual grains, only miscellaneous grains appear to have exceeded the 1957-58 level and only by a small margin. Production of potatoes continues to decline gradually.

Of the other major crops produced in China, the situation is similar to that for food crops except that recovery has not been so fast since the calamity years of 1959-61. A few exceptions are noteworthy, however. Great emphasis has been centered on reviving the cotton industry and this crop has been greatly expanded since 1961; but it has not regained its pre-Leap Forward prominence. One crop that has exceeded the pre-Leap Forward acreage and production is sugar, which has been a happy surprise to the regime. This was accomplished by devising a high incentive program with peasant farmers. The success of this program has enabled the regime to substantially reduce imports of sugar. Vegetable oilseed crops have not regained pre-Leap levels of acreage and production, although peanuts have made considerable progress in recent years. Tobacco, both the Flue-cured and native types, likely has exceeded former levels of production. Soybeans are still well below their former level of both acreage and production. Rapeseed's comeback has been slowed by the program to use this crop's area for the production of green manure crops as a measure to increase the fertility of riceland during the winter.

Essentially all of China's crops were affected similarly by the Great Leap policies and the bad weather, but their return to their former level of production has varied. Major emphasis was aimed at restoring the production of food crops. This involved not only the shifting of acreage of many nonfood crops but resulted in net losses of acreage of

²⁰⁸ At the tenth plenary session of the eighth Central Committee of the Chinese Party in June 1963, it was reported that the amount of reclaimed land needed each year to maintain a minimum level of production was 1.65 million acres.²⁰⁹ Based on a 2-percent annual increase in population (15 million persons per year) this amount of land averages 0.11 acre per person. This is only one-third of the amount of cultivated land per capita, as shown on page 208 above.

²⁰⁹ American Consulate General, Hong Kong, *Survey of China Mainland Press*, No. 3021, July 18, 1963, p. 4.

other crops when allocations were made to private plots. Intensive cultivation by peasants on their private plots resulted in a substantial increase in much needed foods high in nutritional value (vegetables, fruits, poultry, pork) and any other crop that would satisfy a food need. Because of these shifts and the lack of an effective reclamation program the multiple cropping index appears to have gained only slightly from the level of 141 in 1957. Even assuming it to be at 145 in 1966, there would still be a smaller sown area than in 1957.²¹⁰ This analysis suggests that with all the shifting of crops during recent years a satisfactory combination of land utilization has not yet been established. It also points to the possibility that some of the former cropland may not be utilized for some time, particularly if the experimentation of the "guaranteed high yield field" project proves successful. Increasing imports of raw cotton and the gradual establishment of synthetic fibers industry point to a possibility of not utilizing all of the former cotton producing area.

The most significant development in land utilization following the Great Leap has been the intensified use of the private plots for both production of food and for sideline enterprises. Although a true measure of the value of production from the plots cannot be made, their contribution to the national economy is significant and their immediate benefit to the peasants has been important. Representing about 5 percent of the total cultivated land, this private sector produces possibly as much as 80 percent of the hogs and 95 percent of the poultry in addition to a large proportion of the fruits and vegetables. Although data are not available, there is some evidence that private plots may supply up to 20 percent of the daily food requirements. This is doubly significant since production from these plots supply a high percentage of the quality foods in the current Chinese diet. Furthermore, a very large share of the increase in farm exports (poultry, eggs, pork, bristles, other animal products, canned fruits and vegetables, etc.) during the last few years has come from the private plots.

Livestock

The livestock industry is a significant factor in Mainland China's agricultural economy. While per capita consumption of meat is small, total production is relatively large. Pork accounts for the bulk of China's meat production, and in total output China ranks third in the world, after the United States and the U.S.S.R. The production of food grains has depended heavily on the livestock industry. Almost all the draft power is furnished by animals, and the maintenance of soil fertility is closely tied to the availability of animal manures. Many items of output from China's livestock are undervalued or not even recorded in national statistics. Yet the industry's total contribution to the total value of agriculture and subsidiary production probably equals about 20 percent.²¹¹ Of vital importance in building up China's foreign exchange earnings is the export of livestock, meat, and animal products which have been increasing since the 1959-61 depression.

²¹⁰ The multiple crop index is obtained by dividing total sown area by the cultivated area. The official figure of 111.8 million hectares (291.6 million acres) of cultivated land and 157.3 million hectares (388.7 million acres) of sown area gives a multiple crop index of 141 for 1957. Assuming an increase to 145, which appears reasonable, gives a sown area of only 154.7 million hectares (382.2 million acres) in 1966.

²¹¹ Eckstein, *op. cit.*, p. 52.

Under the Communist regime, livestock has continued to have a minor role but managed to increase under private ownership up to the time of collectivization. The Great Leap Forward dealt a serious blow to the industry. Peasants slaughtered animals rather than give them to the collectives and communes. Collective production proved costly and unproductive, and it was not until after the establishment of private plots and the inauguration of special programs in the pastoral areas of the country following the Great Leap Forward that progress again was made in building up the industry. Sheep and goats, which were least affected by the socialization drives, continued to increase after suffering an initial setback during the Great Leap Forward. The energetic program by the Government to entice farmers to raise hogs has been effective following the large losses during 1959-61. As a result of these programs, the number of hogs appears to have about regained or slightly exceeded pre-Leap Forward levels. The comeback of large animals (buffaloes, cattle, horses, mules, donkeys, and camels) has not been as rapid as for hogs, but substantial progress has been made. Shortages still exist for draft animals, but the increasing use of tractors in some areas is modifying this need.

The future of the livestock industry is not clear. No goals were mentioned in China's Third Five-Year Plan which commenced in 1966. Numerous problems confront the industry. Foremost of these is the limited supplies of feed, especially in the areas where hogs are produced. Numerous adjustments in the milling and other food industries in the countryside have been effected to provide a more even and a more direct supply of manufacturing wastes to bolster feed supplies. Despite Government help in supplying a certain amount of concentrates including grain, there is the continuous complaint of underfed and underweight hogs being sold to the state. The Government continues to encourage as rapid increase as possible of all categories of livestock. Despite the severe winter in the major livestock areas of northeast and northwest China plus continuous dry weather throughout a large portion of 1966 which adversely affected livestock, official reports indicated sizable gains. The sinking of new wells and the development of irrigation facilities in the Sinkiang and Inner Mongolian pastoral areas indicate the determination by the Communist regime to further expand livestock numbers. This effort, at least, will provide a much better base upon which to support larger numbers of livestock than before the Great Leap Forward provided proper management is maintained.

FOOD REQUIREMENTS AND AVAILABILITES

Food Requirements

Various attempts to determine food requirements and to assess the adequacy of the diets in China were made during the pre-World War II period and also on a much smaller scale by the Communist regime during the period of the severe food shortages of 1959-61. The more recent effort was not sufficiently extensive to provide answers except in a general way. Unlike countries of Western Europe and the United States where surveys on nutrition are a matter of routine in schools, hospitals, and other public establishments or home consumption surveys, China—less than two decades away from long periods of wars

and a civil war—has nothing comparable to offer either on a limited or nationwide scale.^{212, 213}

The Chinese diet is largely vegetarian. That populated areas have been able to fare quite well by the proper choice of different types of cereals, legumes, vegetables, tubers, and roots, and other plants thereby providing a fairly well-balanced diet has been demonstrated by analyses of the dietary habits of some of the better known south Asian countries whose basic food production and level of consumption is similar to that of Mainland China.²¹⁴ In times of severe food shortages, however, as occurred during China's depression of 1959-61, greater risks are involved in maintaining adequate nutritional balance as well as sufficient calories to sustain minimum energy and growth requirements. The extent of these nutritional requirements in Mainland China is not widely known on a clinical basis, particularly by Western analysts. Various experiments and studies, though limited, conducted prior to World War II, however, provide valuable information in relating current food production to needs.

Prewar studies indicate that the caloric intake ranged from a minimum requirement of about 2,300 calories per adult per day to a maximum of about 3,200 calories per adult per day for those performing heavy work. Subsequent analyses show that for the population as a whole, average food intake per person has declined. The average caloric intake for the period 1931-37 was slightly over 2,200 calories per person per day. This amount had declined somewhat prior to the advent of Communist rule.^{215, 216} The 1931-37 period was considered to have about normal conditions for the growing of crops. Cereals (including roots) comprised about 80-90 percent of the caloric intake which was primarily carbohydrates. Nutritionists consider 65-70 percent carbohydrates to be adequate, particularly if 17-25 percent is from fats and 13-15 percent is from proteins.²¹⁷

This ratio does not occur in the average food intake in China; it is much lower. Prewar studies showed the protein intake to be about adequate, that is generally over 60 grams per person per day, which is slightly more than the minimum requirement of 1 gram per kilogram of body weight per day. The great imbalance between vegetable and animal protein,²¹⁸ however, diminishes the effectiveness of these foods. Assuming an average weight of 55 kilograms (121 pounds) for an adult Chinese, the 70.6 and 65.7 grams of proteins per capita per day for 1931-37 and 1947-48, respectively, was adequate. However, over 92 percent was of vegetable origin.²²⁰

Fat intake in China has been consistently low. The nutritional reference standard for fat per capita per day is about 40 grams for China. This means that approximately 15 percent of the total daily

²¹² Shen, *op. cit.*, p. 165.

²¹³ William Kaye, "The State of Nutrition in Communist China," *China Quarterly*, No. 7, July-September 1961, p. 123.

²¹⁴ Jacques M. May, *The Ecology of Malnutrition in the Far and Near East*, Hafner, New York, 1961, see table opposite p. 30.

²¹⁵ Shen, *op. cit.*, pp. 166 and 381.

²¹⁶ United Nations, Food and Agriculture Organization, *Food Balance Sheets*, quoted by Shen, p. 166.

²¹⁷ Kaye, *op. cit.*, p. 123.

²¹⁸ The minimum allowance is about 60 grams of total protein per capita per day, and 20 grams of combined animal and pulse protein of which 10 grams should be animal protein.²¹⁹

²¹⁹ U.S. Department of Agriculture, Economic Research Service, *The World Food Budget, 1970 Foreign Agricultural Economic Report No. 19*, October 1964, p. 23.

²²⁰ Shen, *op. cit.*, pp. 167 and 381.

caloric intake is furnished by fat. In both 1931-37 and 1947-48, the Chinese diet contained about this level of fat, but in recent years this proportion has declined.

Little is known of the mineral and vitamin content of Chinese foods. Historically, many of the diseases attributed to vitamin deficiency, however, have occurred in China, the most recent of which occurred during the years of critical food shortages (1959-61).

Composition of the Diet

The diet in China has largely been adapted to the crop that can be most economically produced. This explains why the diet has such a high composition of cereals and other starchy foods. Its composition has changed very little since prewar times. Generally a more varied diet is available in the cities and industrial areas for those who can afford the higher prices of unrationed foods. The diet, though monotonous by Western standards, has been the standard for generations of Chinese. In times of poor harvests reduction in food intake is immediate, but a good year generally brings an abundance of foods as well as an increase in variety.

North of the Yangtze River a larger variety of grains are eaten. Principal foods include wheat, millet, kaoliang, sweet potatoes, and corn. Soybeans also are used. Rice is a less important food, and in many areas is considered a luxury. South of the river, however, rice is the staple of the diet and in one form or another is eaten as much as three times a day regardless of the financial status. In the south next in importance to rice are sweet potatoes. They are used fresh in season and dried for winter consumption. They are considered the poor man's food. Methods of preparing rice vary, but generally it is steamed as are the various breads—not so much to please the taste but to conserve fuel which is scarce in most of China. Other grains (wheat, barley, millet, kaoliang, corn, and oats) are eaten as gruel or grits or made into noodles, dumplings, or bread. Wheat and millets are considered high standard foods in the north while kaoliang is a low-quality food. Soybeans are consumed largely in the form of bean curd and bean oil.

Because of the longer growing season in the south, it is generally believed that not only is a larger variety of foods available but also a larger proportion are consumed fresh. In colder areas more attention must be devoted to producing foods having a higher degree of preservation (dry cereals), and the variety of vegetable crops is limited; preservation is crude but effective. Although limitations exist, the Chinese have learned through careful selection to construct a reasonably well-balanced diet containing enough of the needed protective foods.

In general very little meat, animal fats, vegetable oils, and oilseeds are consumed, although in areas where the crops are grown, rapeseed oil and peanut oil are important ingredients in the diet. Meat and other livestock products are important in the pastoral regions except in Tibet because of religious beliefs. The Muslims in Sinkiang and northwest China have restrictions against the use of pork but utilize the products of other animals common to the area. Pork is the most important meat consumed throughout the country, but it comprises only a very small part of the diet and generally is eaten only at festive times.

Other foods such as fish are consumed primarily in the areas where they are produced. Sugar, a luxury, is consumed sparingly, but increased production is resulting in increased consumption—much of it in industrial areas. Production of fruits and vegetables has increased as has their consumption since the reestablishment of private plots. The use of milk is confined mainly to child feeding, as a health food for invalids, and for institutional uses.

Availability of Food

A quantitative measure of the per capita availabilities of food in Mainland China is difficult to ascertain because of a lack of reliable data on both population and production of food. Numerous official statements regarding problems of food production, government procurement, rations, and directives to various socialist units in the agricultural sector regarding their responsibility for local control of foodstuffs provides a base for generalizing the food situation. In addition, the composition of imports and exports of food products together with reports of Western travelers have, in recent years, contributed to a better understanding of trends in the availability of food although the average level of food consumption is evasive. According to available information agricultural production since 1949 has not been sufficient to provide the population with an average per capita diet equal in caloric value and nutritional balance to that in 1931-37. In better crop years, notably 1958, the former caloric level may have been equaled but the quality was inferior. The exhaustion of state grain stocks during the depression of 1959-61 and the continuous imports of grains since 1960 attest to the continued inability of domestic production to satisfy food needs.

In November 1953, a decree giving state control over the purchase and sale of grain resulted in a central planned food supply. Although it does not appear that a strict ration was imposed, purchase coupons for food were issued. Fixed quotas were set for food stores, restaurants, boardinghouses, trains, and others. Food consumption in cities dropped. A directive issued in August 1956 established a nationwide grain rationing system for the urban areas; regulated the production, purchase and sale of grain in rural areas; established a production norm for grain-producing household; and stipulated the quantity of grain that could be purchased by grain-deficit households. Subsidiary foods also were rationed; cities received a larger share.²²¹ The grain ration calculated in terms of grams per person per day was as follows:²²²

Class of consumer	Rice area	Wheat area
Laborer—heavy physical work	833	916
Laborer—moderate physical work	667	733
Laborer—light physical work	433	583
White-collar employee	467	517
University and middle school student	533	583
Residents and children over 10	417	458
Children 6 to 10	333	367
Children 3 to 6	217	233
Children under 3	117	133

²²¹ May, *op. cit.*, pp. 20-21.

²²² Gluckstein, *op. cit.*, p. 262.

Rationing, which has become a part of life in China, enabled the government to maintain a high level of agricultural exports. By maintaining this high level of exports, at the expense of consumption, China was able from 1955 through 1960 to change the country's trade to a favorable balance thereby enabling the scheduling of repayment of Soviet credits which occurred during the earlier period of the regime's reign. After 1960 exports of food declined sharply, and, despite increases during recent years, exports of foods have been offset by imports of grain.²²³

An analysis of China's food production, the makeup of foreign trade, and the rationing system suggest that the decline in the availability of foods under the Communists, culminating in the food crisis of 1959-61, was accompanied by a decline in the quality of the diet also. The increased substitution of sweetpotatoes in the south and of coarse grains for wheat in the north and the decline of garden and animal products with the progress of collectivization progressively reduced the value of the diet while heavy workloads were imposed by the Great Leap Forward.

Estimated availability of food for consumption during the period of Communist rule has not attained the minimum standard level of calories, protein, and fat as developed by the Food and Agricultural Organizations of the United Nations.²²⁴ As shown in table 3, the estimated average food intake in Mainland China has varied between 2,000 and 2,200 calories per person per day during periods of about normal weather. It dipped somewhat below 2,000 calories per person per day during periods of the food crisis, reaching the lowest level in the spring of 1961, just prior to the summer harvest.

TABLE 3.—*Estimated intake of calories, protein and fat per person per day, Mainland China, selected years*

	Minimum requirements	1931 to 1937 ²	1958 ³	1959 to 1961 ⁴
Calories.....	2,350	2,200	2,200	1,790
Protein (grams).....	60	71	65	48
Animal and pulse.....	20	26	21	10
Animal.....	10	7	6	3
Fat.....	40	40	32	20

¹ U.S. Department of Agriculture, October 1964, the World Food Budget, 1970, Economic Research Service, *Foreign Agricultural Economic Report No. 19*, pp. 23-25.

² Food and Agricultural Organization Food Balance quoted by T. H. Shen, *Agricultural Resources of China*, Cornell University Press, 1951, pp. 166-167. Also, Food Balance in the Citation, pp. 378-381. Food balance for 22 Provinces only. A food balance for Manchuria by the author showed little difference. If the two were combined the composite food balance would show slightly higher values.

³ U.S. Department of Agriculture, October 1961, the World Food Budget, 1962 and 1966, Economic Research Service, *Foreign Agricultural Economic Report No. 4*.

⁴ U.S. Department of Agriculture, October 1964, the World Food Budget, 1970, p. 102.

During that period many people suffered from so-called famine oedema, the swelling brought on by nutritional deficiencies. Diseases flourished because natural resistance was low. The Government responded to the crop declines by restoring private plots. This improved the vegetable supply and tended to check the decrease in other subsidiary food sources such as pigs and poultry. Even with reduced

²²³ Eekstein, *op. cit.*, pp. 94-116.

²²⁴ United Nations, Food and Agriculture Organization, *Third World Food Survey Basic Study No. 11*, Rome, 1963.

exports, there probably was less vegetable oil available than in 1960. In the spring of 1962 the food situation was slightly better, as much because of the larger 1961 grain crop as because of grain imports.²²⁵

The breaking point between adequate and inadequate levels of food intake is not easily determined as was demonstrated in Europe and Asia after World War II. Large numbers of people lived for substantial periods of time on low levels of nutrition without suffering serious physical damage or becoming unduly susceptible to disease. Since food satisfies basal metabolism, maintenance requirements and energy needs for work, shortages of food generally results in a decline in body activity (work) rather than incidence of malnutrition except for extended periods at which time nutritional symptoms appear. After analyzing available information on the food crisis in China, including the results of some nutritional surveys made during that period, William Kaye²²⁶ concluded that under Chinese conditions, an average food intake of 2,200 calories per day was likely to provide the population with ample food for heavy work. At that level the population would remain in reasonably good physical condition. Below that intake there was bound to be loss of body weight, retarded growth among children, and reduced output among working men and women. This is what happened in 1960. Under these circumstances cases of malnutrition are bound to occur in areas with poor supplies of food-stuffs (apparently providing less than 2,000 calories per day). This condition existed in some areas prior to the summer harvest in 1961.

The same analysis also applies to certain areas during 1961-62. Yao I-lin, Minister of Commerce, stated in late 1960 that the average minimum ration of grain was 25 catties (27.5 pounds) per month for sedentary workers and dependents.²²⁷ This amount of grain (including potatoes) provided about 1,500 calories per person per day. The amount of calories provided by other rationed foods such as meat, sugar, and vegetable oils is not known, nor is the amount obtainable from other food sources known; but it varied from season to season. Peasants had no means of producing food for themselves since their private plots had been incorporated into the communes. Long lines of persons waiting for hours to obtain food products from state stores were common. Incidents of nutritional diseases, rest periods ordered by the Government, and the dispatching of medical technicians and units to rural areas to administer to health and nutritional needs attest to the tight food situation.

Improvement in the weather, the return of private plots to the peasants and large imports of grain eased the critical food situation.²²⁸ Beginning in the latter part of 1961 a gradual improvement in production of crops occurred. Production continued to increase through 1964, with production of food approximating that in 1957. By then, however, upwards of 80 million more mouths to feed had been added. Large imports of grain and a spectacular recovery in production on the private plots brought the estimated per capita availability of foods

²²⁵ Brice K. Meeker, *China: Crisis Over Food*, Shum Printing Co., Hong Kong, Undated.

²²⁶ William Kaye, "The State of Nutrition in Communist China", *China Quarterly*, London, No. 7, July-September 1961, p. 126.

²²⁷ Snow, *op. cit.*, p. 626.

²²⁸ Interviews of numerous Chinese refugees in Hong Kong substantiate the seriousness of the food shortages. See *Out of China*, edited by Francis Harper, The Green Pagoda Press, Ltd., Hong Kong, 1964.

almost up to the level of 1957. Of particular importance was the fact that quality of the diet improved remarkably—the result of a rapid increase in the production of pork, poultry, eggs, vegetables and fruits.

Although there is evidence of continued increases of production in the private sector (but probably at a slower rate), production in the socialist sector—where the major food crops are grown—has declined since 1964. Estimated per capita production of grains in 1965 was about 17 percent less than in 1957. Even including net grain imports of about 5.6 million tons, there was still a per capita grain deficit of about 15.5 percent for the 1965–66 consumption year compared with 1957–58. The caloric value of the 1965–66 diet thus is estimated to be about 2,000 calories with about 80 percent of the calories being supplied by grains and potatoes.²²⁹ Prospects are for a decline in production of basic foods in 1966, about equal imports of grain and a smaller increase of food products in the private sector (private plots). Per capita availability of food supplies, therefore, during 1966–67 is expected to be less than during the previous year, and private plots may be overburdened to supply a greater proportion of foodstuffs.²³⁰

²²⁹ Based on information in U.S. Department of Agriculture, *Foreign Agriculture*, Aug. 8, 1966, p. 7.

²³⁰ Contribution for the *Far East, Mainland China, Oceania Agricultural Situation* (Drafted Dec. 7, 1966) Review of 1966 and Outlook for 1966, U.S. Department of Agriculture, Economic Research Service, Washington, D.C.

CHINESE COMMUNIST INDUSTRIAL PRODUCTION

BY

ROBERT MICHAEL FIELD

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CHINESE COMMUNIST INDUSTRIAL PRODUCTION

I. INTRODUCTION

Taking to heart Lenin's admonition that only through industrialization could China become a socialist state, the Chinese Communists made the development of heavy industry the core of their First Five-Year Plan (1953-57). The rapid growth of heavy industry was to provide the material base for national defense, for the well-being of the people, and for still further increases in industrial capacity. The goal of industrialization soon became identified with overtaking Great Britain in the absolute level of industrial production. In 1958, with the optimism of the Great Leap Forward, the Chinese expected to achieve their goal in 15 years. More recently they have said that it may take from 30 to 50 years, but the goal is the same:

To convert China, step by step, from a backward, agricultural country into an advanced, socialist, industrial state.¹

This paper will present an independently constructed index of total industrial production in Communist China for 1949-65. Although data on the output of specific military items were not available, these items had to be included in the index by imputation, because the weights could not be adjusted satisfactorily to exclude military production. Because most military production is concentrated in the metal processing industry, the assumption implicit in the construction of the index is that the military component of the metal processing industry grew at the same rate as the civilian component. However, if the weight for the metal processing industry could have been adjusted, the rate of growth shown by the resulting index of civilian industrial production would have been lower than that of the index presented in this paper. On the other hand, if military production could have been included explicitly, the indexes for the metal processing industry and for total industrial production both would have been raised.

For the years 1949 to 1959, the index was calculated by weighting data on the physical output of final products in three stages. In the first stage, the physical output series were grouped by branch of industry and weighted by their respective prices. In the second stage, to form an index for industry as a whole, the resulting indexes for individual branches of industry were weighted by estimates of the values added that were computed from the relative shares of the wage bill paid to industrial workers. In the third stage, an index for total industrial production was calculated from the index for industry and a separately calculated index for handicrafts. Because data on the earnings of handicraft workers were not available, an estimate of the values added by industry and handicrafts was derived from Chinese

¹ *First Five-Year Plan for Development of the National Economy of the People's Republic of China*, Peking, 1956, p. 13.

Communist data for the net value of total industrial production.

For the years 1960-65, because handicraft production could not be separated from the production of industrial enterprises and because the number of physical output series was greatly reduced, separate indexes could not be calculated for individual branches of industry or for industry and handicrafts. An index for total industrial production was calculated by weighting the series for which estimates of physical output were available by their respective prices and adjusting the resulting index for the difference between its rate of growth and that shown by the index of total industrial production for the years 1953-57.

The index is more reliable for the years 1949-57 than it is for the years 1958-65. Through 1957, the data on which the index is based are reasonably accurate and their coverage is sufficiently broad for the index to be used with confidence. For the years 1958-59, although allowances were made for the deterioration in the quality of the items produced and for the tendency of official sources to exaggerate achievements in production, there may still be a small upward bias in the index. For the years since 1960, however, the index should be regarded as providing only a general indication of the trend in industrial production, because the estimates of physical output are subject to a wider range of error and because the size of the sample is greatly reduced.

My index of industrial production for Communist China is less reliable than indexes for Western European countries and is also less reliable than indexes constructed by Western scholars for other Communist countries. Because of the large body of data made available by highly developed statistical reporting systems, and because of the detailed analytical work that has been done, the indexes for these countries reflect accurately the growth of industrial production. My index for Communist China may not even be as reliable as the indexes for many of the less developed countries. Because of problems in statistical reporting in the less developed countries, individual output series may be no more accurate than those for China, but more complete coverage means that the indexes probably reflect the growth of industrial production more accurately than my index reflects the growth in China.

The growth of industrial production in Communist China, as measured by the index described above, is discussed in section II. As an aid to the evaluation of the index, comparisons are made with the growth of industrial production in other countries in section III and with two other independently constructed indexes of Chinese industrial production in section IV. Finally, the prospects for the growth of industrial production during the Third Five-Year Plan (1966-70) are discussed in section V. The index is described in detail in appendix A, the principal sources of data on the production of industrial commodities are discussed in appendix B, and alternative estimates of physical output for those commodities used in the construction of the index for the years 1960 to 1965 are presented in appendix C.

II. SUMMARY OF THE GROWTH OF INDUSTRIAL PRODUCTION

Industrial production in Communist China, as measured by the index presented in this paper, grew rapidly during the years 1949-65,

at an average annual rate of 11 percent, but the differences from year to year and by branch of industry were extreme. My index and the official Chinese Communist index for total industrial production, industry, and handicrafts are shown in table 1. The average annual rates of growth for individual branches of industry for the years 1950-52, 1953-57, and 1958-59 are presented in table 2; and the structure of industrial production in 1949, 1952, 1957, and 1959 is presented in table 3. It was not possible to calculate the rates of growth by branch of industry or the structure of industrial production for the years since 1959 because of the lack of data.

TABLE 1.—*Indexes of industrial production in Communist China, 1949-65*

[1956=100]

	Field			Official ¹		
	Total	Industry	Handicrafts	Total	Industry	Handicrafts
1949	27.2	21.8	56.9	19.9	18.4	27.7
1950	34.3	29.0	64.2	27.2	24.0	43.2
1951	45.6	41.2	70.2	37.5	34.5	52.5
1952	56.1	53.1	72.3	48.8	46.1	62.5
1953	70.2	65.2	97.9	63.5	60.6	77.9
1954	80.2	76.0	103.7	73.9	70.8	89.4
1955	80.7	78.8	91.2	78.0	76.3	86.5
1956	100.0	100.0	100.0	100.0	100.0	100.0
1957	109.4	111.0	100.2	111.4	110.8	114.3
1958	143.8	149.8	110.2	185.2	-----	-----
1959	181.6	192.4	121.3	² 257.9	-----	-----
1960	188.5	-----	-----	³ 332.3	-----	-----
1961	124.5	-----	-----	-----	-----	-----
1962	109.6	-----	-----	-----	-----	-----
1963	120.7	-----	-----	⁴ 184.0	⁵ 198.7	⁶ 110.7
1964	134.9	-----	-----	⁷ 211.6	-----	-----
1965	147.6	-----	-----	⁸ 234.9	-----	-----

¹ State Statistical Bureau, *Ten Great Years*, Peiping, 1960, pp. 87 and 94, except as noted.

² *Press Communique on the Growth of China's National Economy in 1959*, Peiping, 1960, p. 1.

³ Planned. Li Fu-ch'un, "Report on the Draft Plan for 1959," *Jen-min jih-pao (People's Daily)*, Mar. 31, 1960.

⁴ Derived from the statement that the gross value of handicraft output was about 10 percent of the gross value of total industrial production. See "Consolidate and Enhance Handicraft Cooperatives in Order to Actively Develop Handicraft Production," editorial, *Jen-min jih-pao (People's Daily)*, Oct. 27, 1963. For the gross value of handicraft output, see footnote 6 below.

⁵ Derived from the gross value of industrial output, which is the difference between the gross value of total industrial production and the gross value of handicraft output.

⁶ Derived from the statement that the gross value of handicraft output was more than 4 times that of 1949. See T'ien P'ing, "Great Changes in the Handicraft Industry in the Past Fifteen Years," *Ta-kung pao (Impartial Daily)*, Oct. 9, 1964. For the gross value of handicraft output in 1949, see footnote 1, above.

⁷ Derived from the 15-percent increase reported in Chou En-lai's speech to the 1st session of the 3d National People's Congress on Dec. 21-22, 1964. See American Consulate General, Hong Kong, *Survey of China Mainland Press*, No. 3370, Jan. 5, 1965.

⁸ Planned. Derived from the planned increase of 11 percent. See *ibid*.

TABLE 2.—*Average annual rates of growth of industrial production, by branch, 1950-52, 1953-57, and 1958-59*

	1950-52	1953-57	1958-59
Total industrial production	27	14	29
Industry	35	16	32
Electric power	19	22	46
Coal	27	14	41
Petroleum	53	27	59
Ferrous metals	110	31	41
Metal processing	43	19	39
Chemical processing	60	26	40
Building materials	63	19	34
Timber	25	20	22
Paper	51	20	33
Textiles	36	9	26
Food	22	12	15
Handicrafts	8	7	10

TABLE 3.—Structure of industrial production in Communist China,¹ 1949, 1952, 1957, and 1959

[Percent of value added]

	1949	1952	1957	1959
Total industrial production.....	100	100	100	100
Industry.....	68	80	86	90
Electric power.....	2	1	2	3
Coal.....	11	11	1	13
Petroleum.....	(?)	1	1	1
Ferrous metals.....	1	3	6	7
Metal processing.....	9	13	16	19
Chemical processing.....	1	2	3	3
Building materials.....	3	7	8	9
Timber.....	5	5	6	5
Paper.....	1	1	1	1
Textiles.....	16	20	15	15
Food.....	20	17	16	13
Handicrafts.....	32	20	14	10

¹ Because of rounding, components may not add to the totals shown.² Negligible.

A. ECONOMIC REHABILITATION, 1949-52

During the period of economic rehabilitation (1949-52), my index shows that industrial production more than doubled, growing at an average annual rate of 27 percent. This rapid rate of growth was characterized by large increases in employment, but 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. Industry grew at an average annual rate of 35 percent and handicrafts at 8 percent.

Within industry, the rates of growth ranged from 19 percent in the electric power industry to 110 percent in the ferrous metals industry. The branches of industry producing industrial materials, such as ferrous metals, chemical processing, and building materials, had the highest rates of growth. These branches were followed by the metal processing industry and then less closely by the fuels and the light industries. Although the growth of the fuels and light industries was relatively slow, the rates achieved were quite high.

There are no reliable indexes of industrial production by branch of industry for the pre-Communist period with which my indexes for the period of economic recovery can be linked, but the production of key industrial commodities may be used as a rough measure. A comparison of the rates of growth shown by individual branches of industry for the years 1950-52 and the percentage decline in the production of key commodities from their peak to the level of output achieved in 1949 shows an inverse relationship. It is clear, therefore, that the rapid growth of total industrial production in this period represents a return to previously achieved levels of output rather than a growth in the productive capacity of industry and that the differences in the rates of growth shown by individual branches of industry are closely related to the extent to which production had fallen from the pre-Communist peak levels.

B. THE FIRST FIVE-YEAR PLAN, 1953-57

During the First Five-Year Plan (1953-57), industrial production is estimated to have doubled again, reaching a level more than four times that of 1949, but the rate of growth was slower and less steady than it had been during the period of economic rehabilitation. Although averaging 14 percent, the annual increases ranged from less than 1 percent in 1955 to 25 percent in 1953.

The large increase in output in 1953 resulted from a 9-percent increase in the net value of fixed capital assets and an increase of 16 percent in the average number of workers. The relatively slow growth in capital assets and the rapid growth in employment, however, are more typical of the period of economic rehabilitation than they are of the rest of the First Five-Year Plan, when capital assets increased at a rate in excess of 20 percent annually, but employment increased at only 7 percent. These data, together with fragmentary data on the continued increase in the intensity with which existing capacity was used, indicate that the large increase in output achieved in 1953 was a continuation of the rapid growth achieved during the period of economic rehabilitation and tend to suggest that the pre-Communist peak level of production was not reached until 1953. Because 1953 was really part of the period of economic rehabilitation, the average annual rate of growth of 12 percent achieved during the years 1954-57 is a better measure of industrial growth in China than the rate for the First Five-Year Plan as a whole.

During the 5-year period, industry grew at an average annual rate of 16 percent and handicrafts at a rate of 7 percent. Within industry, the rates of growth for individual branches were lower and the range in the rates was narrower than it had been during the period of rehabilitation, varying from 9 percent in the textile industry to 31 percent in the ferrous metals industry. The general pattern of the rates of growth shown during the First Five-Year Plan was much the same as it had been during the period of recovery, the most marked change being the relative improvement in the rates of growth shown by the fuels industries.

Different factors determined the general pattern of growth in the two periods. Whereas the relative rates of growth during the period of rehabilitation had been determined largely by the extent to which the disruption of production has been repaired, the pattern of growth during the First Five-Year Plan was the result of investment-policy decisions made by the Chinese Communist regime. Since the regime decided to adopt the Soviet model of industrialization and concentrated investment in heavy industry, heavy industry, quite naturally, grew more rapidly than light.

C. THE LEAP FORWARD, 1958-60

During the Leap Forward (1958-60), the average annual rate of growth in industrial production surged to 20 percent. This growth was accompanied by a massive increase in industrial employment and by mass emulation campaigns requiring an intensity of work that could not be maintained. The rate of growth dropped from 31 percent in 1958 to 26 percent in 1959 and only 4 percent in 1960.

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 and a rapid growth in the net value of fixed capital assets. For example, of the 921 major industrial construction projects started during the First Five-Year Plan, 428 were completed and in normal operation by the end of 1957, and 109 went into partial operation.² But in 1958 alone, a large number of new construction projects were started and 500 were completed.³ Merely putting these new plants into operation would have been enough to guarantee China substantial gains in industrial production. The true accomplishments in industry during these 3 years, therefore, were achieved in spite of the excesses of the Leap Forward.

In 1958-59, industry grew at an average annual rate of 32 percent and handicrafts at 10 percent. Within industry, the rates of growth were nearly as high as those achieved during the period of economic rehabilitation, but the range was not as wide. The highest rate of growth was shown by the petroleum industry, which grew at 59 percent, and the lowest was shown by the food industry, which grew at 15 percent. The most striking change in the pattern of rates of growth shown by the individual branches of industry was the rise in the position of the fuels industries. Ranking the branches of industry by the rates of growth shown during the period of rehabilitation, the First Five-Year Plan, and the Leap Forward, it can be seen that the petroleum industry rose from fourth place in 1950-52 to become the fastest growing branch of industry during the Leap Forward. The electric power industry rose from 11th place to second, and the coal industry rose from ninth to third. Thus, the fuels industries became the three fastest growing branches of industry.

D. RECOVERY AND READJUSTMENT, 1961-65

Total industrial production fell sharply in 1961 and continued to fall, although less sharply, in 1962. Production in 1962 was slightly above the level of 1957 but only about 60 percent of the peak reached in 1960. After the withdrawal of the Soviet technicians in mid-1960, the Chinese found they could not operate many of the key industrial plants that had been built as Soviet aid projects and were forced to close them down. In light industry, the levels of output achieved during the Leap Forward could not be maintained because of the failure of agriculture to supply needed 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.

With the adoption of more pragmatic policies in 1962, industry began to recover. In each year since 1962, total industrial production has increased by about 10 percent, reaching in 1965 a level slightly

² State Statistical Bureau, "Communiqué on Fulfillment and Overfulfillment of China's First Five-Year Plan," New China News Agency, Apr. 13, 1959; in American Consulate General, Hong Kong, *Current Background*, No. 556, Apr. 15, 1959, p. 3.

³ Derived by subtracting the number of projects reported for the years 1953-57 in the work named in footnote 2 from the number reported for the years 1953-58 in State Statistical Bureau, *Ten Great Years*, Peking, 1960, p. 67.

higher than that of 1958. This growth, however, has been achieved by the gradual reemployment of capacity that had been installed during or prior to the Leap Forward rather than by the addition of new productive capacity. Because almost all idle capacity has now been put back into production, and because few capital construction projects have been undertaken since 1960, further increases in output will be more difficult to achieve than those of the 3 years, 1963-65.

The number of output series available for the years since 1960 is not large enough to permit estimates for individual branches of industry, but the series do indicate the general pattern of growth. The output of primary energy is now about the level of 1958, but it is still far below the peak level of 1960. The relative importance of the various sources of energy has changed. Although coal still provides the bulk of the primary energy, it has declined in relative importance. In 1957 coal supplied 95 percent of all primary energy, but in 1965 it supplied only 91 percent. Petroleum has risen from 2 percent in 1957 to 6 percent in 1965, and water power has remained at about 3 percent.

By far the most spectacular performance in the field of industrial materials has been shown by the chemical processing industry. The output of chemical fertilizer in 1965 was more than five times that of 1957 and nearly double the previous peak level of 1960, and the Chinese claim that by 1963 the chemical processing industry had become the fourth largest branch, having risen from seventh place in 1952.⁴ The output of most industrial materials, however, is not yet back to the peak levels of 1959 or 1960. The output of crude steel in 1965 was about equal to the volume of usable steel produced in 1959, and the output of cement and timber were at about the levels of 1958.

There are not sufficient data to make a precise estimate for the metal processing industry. Output is certainly well above the level of 1957, but has probably not yet reached the level of 1958. Output may be on the order of 30 to 40 percent greater than that of 1957. On balance, the output of heavy industry as a whole in 1965 had not yet reached the level of 1959, although it probably exceeded the level of 1958.

The level of output in light industry has recovered more slowly than heavy industry, because of the failure of agriculture to provide an adequate supply of raw materials. The output of paper in 1965 was about 25 percent above the level of 1957 but still nearly 10 percent below that of 1958. The output of cotton cloth was less than 80 percent of the output achieved in 1957. Although the output of woolen and silk cloth has recovered more rapidly than that of cotton cloth and may be approaching peak levels, the textile industry as a whole is probably still below the level of 1957, because of the importance of cotton cloth. The food industry has recovered more rapidly than the textile industry. The output of sugar has already exceeded the previous peak level achieved in 1959. Sugar, however, is not typical of the food industry as a whole. The aggregate output of the food industry is certainly above the level of 1957 but has probably not yet reached the level of 1958. On balance, the output of light industry as a whole in 1965 was probably only slightly higher than the level of 1957.

⁴ "Rapid Growth of China's Chemical Industry," *Jen-min jih-pao (People's Daily)*, Sept. 25, 1964.

III. A COMPARISON WITH INDUSTRIAL PRODUCTION IN OTHER COUNTRIES

To place the Chinese accomplishment in perspective, the average annual rates of growth of industrial production in Communist China are compared with those of the Soviet Union, Japan, and India in table 4. The rate of growth achieved by Japan over the last 16 years (to 1965) is considerably higher than the rates of growth shown by the other three countries. Surprisingly, Communist China had the second highest rate of growth, exceeding slightly that shown by the Soviet Union. By far the lowest rate of growth of these four countries is that shown by India.

TABLE 4.—Average annual rates of growth of industrial production for selected countries¹

	Soviet Union	Japan	Communist China	India
1949 to 1965.....	9.6	14.9	11.2	6.5
Prewar to 1965.....	² 6.4	³ 5.6	⁴ 4.4	⁵ 4.2
Year in which previous peak was regained to 1965.....	⁶ 9.6	⁷ 13.8	⁶ 6.4	⁷ 6.7

¹ Calculated from the data in table 10.

² Initial year 1937.

³ Initial year 1933.

⁴ Initial year 1949.

⁵ Initial year 1955.

⁶ Initial year 1953.

⁷ Initial year 1951.

The rates of growth for the postwar period, however, are not satisfactory indicators of the relative performance of industry in these four countries, in part because of differences in the extent to which they had recovered from wartime damage. In 1949, for example, the level of production in Communist China was probably lower than it had been at any time since the early 1930's, whereas the Soviet Union had already regained its previous peak level of output. It is clear, therefore, that the average annual rate of growth shown by Chinese industry exceeded that of the Soviet Union only because of the very large increases in output achieved during the period of economic rehabilitation.

For this reason, the rates of growth for prewar to 1965 are also shown in table 4. Over this longer period, the rates of growth are slower, their range is narrower, and their ranking is changed. The Soviet Union shows the highest rate of growth, followed closely by Japan, with China and India trailing. The two latter countries show almost the same rate of growth.

The changes in the rates of growth that result from the inclusion of the prewar period are strongly affected by the wartime experience. Industrial production in the Soviet Union, which reached its peak level in 1940 or 1941, had fallen to about one-half of its peak level by 1945. Industrial recovery, however, was rapid and output had regained its peak by 1949. In Communist China, the peak level was probably not reached until 1943 or 1944, a time when the Japanese controlled most of the important industrial facilities. Production collapsed in 1945 and continued to decline during the period of the civil war, probably

falling to 40 percent of its peak in 1949. After the restoration of peace and order in 1949, industrial production recovered very rapidly indeed, regaining its peak level by 1953.

The Japanese experience was even more extreme than that of China. Japan reached a peak in 1941 and remained at about that level through 1944. Because of the damage and severe curtailment of imports of raw materials sustained during the last 2 years of the war, production in 1946 plummeted to only one-fifth of its peak level. Not only was the decline greater than that in the Soviet Union or China, but the rate of growth during the period of recovery was slower and more erratic. Japan did not regain her peak level of production until 1955. The pattern of change in India is in marked contrast to that of the other three countries. Industrial production in India remained virtually unchanged between 1940 and 1950. There was a slight decline in output in 1946 and 1947, but output in 1947 was only 12 percent below the peak level of 1945.

In an attempt to allow for the differing impact of the war on the growth of industrial production in these countries, the average annual rates of growth have also been calculated for the period covering the year in which the previous peak level was regained through 1965. These rates of growth are more typical of the recent growth of industrial production than those for prewar to 1965 or for 1949-65. The rates of growth are as high as those for 1949-65 and the range is as wide, but the upward bias due to the inclusion of the large increases in Chinese industrial production during the period of economic rehabilitation is removed.

Because a comparison of the pattern of change in the rates of growth from year to year is also of interest, the indexes of industrial production are plotted in chart 1. The chart shows that the growth of industrial production in Japan and India has been sustained and quite steady. The growth of industrial production in the Soviet Union has also been sustained, but the rate of growth has been declining. The growth of industrial production in Communist China, however, has been very erratic.

IV. A COMPARISON WITH OTHER INDEXES OF CHINESE INDUSTRIAL PRODUCTION

The growth of industrial production in Communist China has been measured in two other studies. One of these was prepared by Chao Kang.⁵ Chao constructed an index for the years 1949-59 using the same type of weighting system that is used in the index presented in this paper. The other study is part of a larger work by Liu Ta-chung and Yeh Kung-chia, who made estimates of value-added for the years 1933 and 1952-59.⁶ The rates of growth for total industrial production during the First Five-Year Plan (1953-57) as measured by the indexes presented in these two studies are very similar to that shown by my index. A detailed comparison of the indexes, however, shows that

⁵ Chao Kang, *The Rate and Pattern of Industrial Growth in Communist China*, Ann Arbor, 1965.

⁶ Liu Ta-chung and Yeh Kung-chia, *The Economic Development of the Chinese Mainland, National Income and Economic Development, 1933-59*, Princeton, 1965.

the similarity in the rates of growth is due to compensating differences in concept, in coverage, and in estimates of physical output. One of the differences between my index and the Chao index is in coverage. Chao's index includes two branches of industry not in-

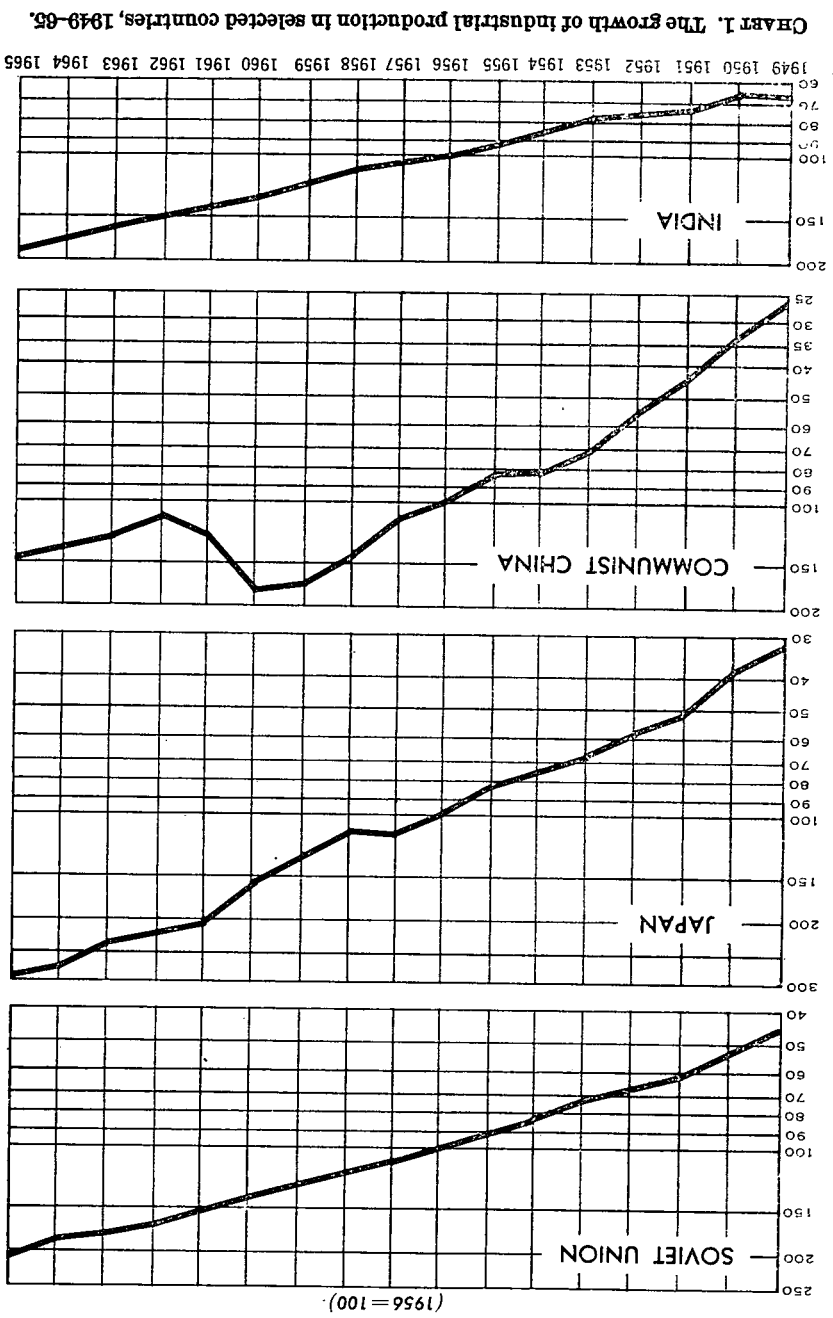


CHART 1. The growth of industrial production in selected countries, 1949-65.

cluded in my index: the nonferrous metals and the "daily-use commodities"⁷ industries. Another difference in coverage is that my index includes the entire metal processing industry, but Chao's includes only machine building, one of the three subbranches of the metal processing industry.

A second difference is in concept. Chao uses the largest possible sample to measure the rate of growth, whereas I exclude series for intermediate products consumed largely within the branch of industry in order to make the individual branch indexes approximate value-added as closely as possible. In the ferrous metals industry, for example, I used only the output series for rolled steel, although data were available for the production of iron and manganese ore, pig iron, and crude steel.

Another difference is in estimates of physical output. Chao's index for the timber industry, for example, is derived from his estimates of the amount of timber cut, but his estimates understate the rate of growth in output because his figure for 1952 includes the timber cut by all timber enterprises,⁸ whereas his figures for 1955 and 1956 include only the timber cut by state-operated enterprises.⁹ The figure for 1957 also understates the output, but for a different reason. It is a planned figure rather than the level of output actually achieved.¹⁰

The principal difference between my index and the Liu-Yeh index is in coverage. The coverage of total industrial production in both indexes is the same as the coverage of *industry and handicrafts* as defined by the State Statistical Bureau. The State Statistical Bureau divides this universe into the following categories:

a small amount of handicraft mining is ignored, factories, mining, and utilities correspond closely to the official category of modern industry; and handicrafts (as defined by Liu and Yeh) corresponds to the

Industry:

Modern industry.

Factory handicrafts.

Handicrafts.

Following the practice of the State Statistical Bureau, I have divided total industrial production into industry and handicrafts, but Liu and Yeh have not. Instead, they have divided total industrial production into the categories of factories, handicrafts, mining, and utilities. If official categories of factory handicrafts and handicrafts.

⁷ "Daily-use commodities" does not appear to be an officially designated branch of industry, because it is not listed in any published version of the Chinese Communist industrial classification system. When the Chinese discuss consumer goods, however, they frequently divide them into commodities to eat, commodities to wear, and commodities to use, and this last category is referred to as *jih-yung-p'ing* (commodities for daily use). But each of the 11 groups included in this category by Chao I-wen in *Hsin chung-kuo ti kung-yeh* (*The Industry of New China*), Peiping, 1957, corresponds to a branch or subbranch listed in the 1956 *Abridged Classification of Industrial Branches* (see State Statistical Bureau, *Kung-yeh t'ung-chi-hsüeh chiang-i* [Lectures on the Study of Industrial Statistics], Peiping, 1958, pp. 32-35). This identification of the groups means that "commodities for daily use" is not a separate branch of industry, but merely a convenient way to refer to those consumer goods that are neither eaten nor worn.

⁸ *First Five-Year Plan for Development of the National Economy of the People's Republic of China*, Peiping, 1956, p. 49.

⁹ Chao cites Li Choh-ming, *Economic Development of Communist China*, Berkeley, 1959, p. 44, but a Chinese source indicates that the figures refer only to state-operated enterprises. See State Statistical Bureau, "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet *Kuan-yü 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. Peiping, no publication date, pp. 32-33.

¹⁰ Chao cites Chao I-wen, *Hsin chung-kuo ti kung-yeh* (*New China's Industry*), Peiping, 1957, p. 52, but the figure originally appeared in the First Five-Year Plan.

Another important difference is in the method of estimation. I based my index on a sample of commodities that I consider to be typical of the commodities produced by the various branches of industry. But Liu and Yeh were forced to make estimates for the entire output of industry, because they wanted to measure the level as well as the trend. They made direct estimates for those commodities that they could identify but had to make indirect estimates for the rest. Although the actual computation was a complicated process, conceptually the method used to estimate value added involved only four steps. The first was to adjust the official data on the gross value of industrial output from the official classification system to the system selected by the authors. The second step was to identify as much of the physical content of each category as possible. For this purpose, a commodity was considered to be identified if both price and physical output were known or could be estimated. The third step was to divide the gross value of output for each category derived in step one into identified and unidentified portions. The gross value of the identified commodities was the sum of price times quantity, and the gross value of the unidentified commodities was the residual.

The fourth step was to estimate value added. The value added by the identified commodities was estimated directly. Because no data on value added were available for 1952 or for any other year since 1949, data from two Japanese studies of industry in northeast China in 1939 and 1943, respectively, were used. The value added by the unidentified commodities, however, had to be estimated indirectly. These commodities were considered to be those successfully identified in 1933 but not identified for 1952 or later years. The estimates of value added for the unidentified commodities were made by applying the average ratio of value added to gross value for all unidentified commodities in 1933 to the gross value of the unidentified commodities derived in step three on the assumption that this ratio had not changed. This procedure means, in effect, that real value is attributed to the double counting which results from methodological deficiencies in the compilation of official data on the gross value of industrial output.

My index for the year 1957 is compared with the Chao and the Liu-Yeh indexes in table 5. There is substantial agreement between the three indexes for the growth of total industrial production, but the similarities in the aggregates conceal differences in detail. The rate of growth shown by my index for industry is considerably higher than that shown by the Chao index and substantially lower than that shown by the Liu-Yeh index. For handicrafts, the divergence is even wider, but the ranking of the indexes is reversed: My index grows more slowly than the Chao index but faster than the Liu-Yeh index.

Within industry, the branch showing the greatest divergence is the machinebuilding industry. The rate of growth shown by the Liu-Yeh index for the machine-building industry is extremely high because it is based on the officially reported gross value data rather than on an independent calculation. The full extent of the difference between my index and the Chao index for machine building is not shown by the index numbers for 1957. In 1956, however, the Chao index is 351.3 whereas my index is only 282.0. The high rate of growth shown

TABLE 5.—A comparison of 3 indexes of Chinese industrial production for 1957
[1952=100]

	Field	Chao ¹	Liu-Yeh ²
Total industrial production.....	195.1	189.8	194.2
Industry.....	208.8	195.9	240.2
Electric power.....	266.4	266.4	265.9
Coal.....	195.6	187.7	194.0
Petroleum.....	334.4	334.4	334.4
Ferrous metals.....	386.5	353.7	354.0
Nonferrous metals.....	241.0	370.0	-----
Metal processing.....	284.1	271.5	441.1
Machine building.....	312.9	314.2	277.3
Chemical processing.....	239.8	241.6	269.3
Building materials.....	252.9	199.6	-----
Timber.....	245.6	220.1	253.9
Paper.....	153.2	136.7	138.6
Textiles.....	180.2	156.2	168.7
Food.....	138.7	164.8	114.0
Handicrafts.....	-----	-----	-----

¹ Chao Kang, *The Rate and Pattern of Industrial Growth in Communist China*, Ann Arbor, 1965, pp. 88 and 96.

² Liu Ta-chung and Yeh Kung-chia, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-59*, Princeton, 1965, pp. 66, 146, 573, and 585. The index of total industrial production is derived from data on the value added (in 1952 yuan) by industry and handicrafts, and the value added by industry is derived from data on factories, mining, and utilities. The indexes for electric power, coal, and petroleum are derived from the data on net value added in *ibid.*, pp. 573 and 585. The indexes for all other branches of industry are derived from the data on gross value added in *ibid.*, p. 146. Ferrous metals is the sum of pig iron, steel, and rolled steel; building materials is the sum of cement, sheet glass, and other construction materials; textiles is the sum of cotton yarn, cotton cloth, silk, silk piece goods, woolen textiles, grass cloth, and knitted goods; and food is the sum of sugar, milled rice, wheat flour, edible vegetable oils, and cigarettes.

by the Chao index for the year 1956 appears to be the result of over-weighting merchant vessels and including a number of very rapidly growing but relatively unimportant manufactured consumers' goods.

For the years 1958-59, the divergence between the three indexes for total industrial production, for industry, and for handicrafts is greater than in the earlier years. A detailed comparison of the indexes cannot be made easily, however, because Chao does not present indexes by branch of industry and because Liu and Yeh leave gaps in their estimates. Liu and Yeh, for example, do not present data on the machine-building industry for these years. If 1957 is taken as 100, the three indexes for 1959 are:

	Field	Chao	Liu-Yeh
Total industrial production.....	166.1	174.3	147.1
Industry.....	173.3	189.6	156.8
Handicrafts.....	121.1	100.0	111.5

V. THE PROSPECTS FOR INDUSTRY DURING THE THIRD FIVE YEAR PLAN, 1966-70

The prospects for industry in Communist China during the Third Five-Year Plan (1966-70) are a matter of great concern, not only in China, but throughout the Western World. The current political turmoil in China, however, makes any attempt to forecast the growth of industrial production over the next 5 years unusually hazardous.

The current cultural revolution was not originally planned for economic reasons. Important documents such as the *Decision of the Central Committee of the Chinese Communist Party on the Great*

*Proletarian Cultural Revolution*¹¹ or the *Communique* of the 11th Plenary Session of the Central Committee¹² (held on August 1-12, 1966) make only passing references to economic matters. But there are already rumors to the effect that production has declined, at least in some enterprises, because of the time and energy required of managers and workers alike for demonstrations, parades, and endless meetings to discuss the thought of Mao Tse-tung.¹³

Since early September 1966, the regime has been concerned with the impact of the cultural revolution on production. The front-page editorial in *Jen-min jih-pao* on September 7 stated that production must not be interrupted. Workers were instructed to stay at their jobs, and the Red Guards were cautioned not to interfere. The frequency with which these themes have been repeated by national and provincial news media indicates that the concern is genuine. Production has been affected already, but it is not yet clear whether the cultural revolution will spill over directly into the field of economics. Statements such as the following have appeared frequently in the Chinese press:

The unprecedented scale of the present great cultural revolution necessarily presages a flying leap in the development of our Socialist revolution and a new Great Leap Forward in Socialist construction.¹⁴

The tone of these statements has led to the speculation that the Third Five-Year Plan may be superseded just as the Second Five-Year Plan was superseded by the Leap Forward.

If a new Leap were in the making, one would expect to see drastic increases in targets and production claims, and in fact, recent claims are strongly reminiscent of those made in 1958 and 1959. For example, the claims that industrial production in the first 8 months of 1966 increased by 20 percent over the corresponding period of last year and that the increase in the output of various industrial commodities ranged from 40 to 200 percent¹⁵ appear to be unreasonably high. But there is, as yet, no evidence that targets have been raised.

On balance, it does not now appear likely that the Chinese Communists will attempt a new Leap, but given the current political instability, it is not impossible. If they did, however, it would be doomed to failure. Industrial production might spurt ahead briefly, but any new Leap would undoubtedly collapse. The collapse would be worse than that of 1961-62 because the Chinese do not have the cushion now that they had in 1958 and the population has increased by some 100 million persons.

Industrial production has increased at about 10 percent annually during the last 3 years and has regained the level achieved in 1958, but even without a new Leap Forward or the disruptions of the cultural revolution, the Chinese would not be able to maintain such a high rate of growth. The increases in production during this period of readjust-

¹¹ *Jen-min jih-pao (People's Daily)*, Aug. 9, 1966.

¹² *Jen-min jih-pao (People's Daily)*, Aug. 14, 1966.

¹³ On Oct. 17, 1966, for example, *Tass* reported that the output of cotton cloth at the No. 1 textile mill in Peking had dropped by 360,000 meters a month because of activities undertaken in connection with the cultural revolution. The loss was attributed specifically to absenteeism by members of the Red Guard, who constituted over one-third of the workers at the mill.

¹⁴ *Jen-min jih-pao (People's Daily)*, June 8, 1966.

¹⁵ New China News Agency, International Broadcast, Sept. 30, 1966.

ment have been based on the reemployment of existing capacity. Very little new capacity has been installed since the collapse of the Leap Forward in 1960, and the margin for investment is small.

The chief determinants of the growth in industrial production over the next few years will be the manner in which the limited resources available for investment and defense are allocated and the performance of agriculture. If the limited resources available, the scarce materials and skilled manpower, continue to be concentrated in the weapons program, the output of heavy industry will expand only slowly.

Most of the capacity not now in production is concentrated in light industry, especially in textiles, but the failure of agricultural production to keep up with the increase in population means that agriculture will not be able to supply the raw materials necessary for light industry. The output of industrial crops will continue to be sacrificed in favor of food crops. Continued weak performance of agriculture will mean that light industry will not grow rapidly and that the output of many light industrial products probably will not reach their previous peak levels during the Third Five-Year Plan.

In summary, the drain of the weapons program on heavy industry and the dependence of light industry on agricultural raw materials would seem to preclude a rapid rate of growth during the Third Five-Year Plan. Simply to regain the level of production achieved in 1960 by the end of the Third Five-Year Plan, industrial production will have to grow at a rate in excess of 5 percent annually. If the Chinese do not attempt a new Leap, they probably can maintain a rate of growth of 5 percent and may well regain the previous peak level of industrial production by 1970, but the misguided economic policies of the Leap Forward will have cost China a full decade's industrial growth.

APPENDIX A

DESCRIPTION OF THE INDEX

The index of industrial production in Communist China presented in this paper was calculated primarily from data on the physical output of final products, although some intermediate products were included where data on final products were not available. These physical output series were weighted in three stages to form the indexes for the individual branches of industry, the indexes for industry and handicrafts, and the index for total industrial production.

I. THE PHYSICAL OUTPUT DATA

Both the coverage and the accuracy of the physical output data are more adequate for the period of economic recovery (1949-52) and the First Five-Year Plan (1953-57) than for the Leap Forward (1958-60) or for the recent period of readjustment (1961-65). The index for the earlier years was based on a sample of 33 commodities produced by industrial enterprises and eight commodities produced by handicrafts. These data were drawn primarily from official sources. It is believed that these data are reasonably accurate and that their coverage is sufficiently broad for the index to be used with confidence.

For the years 1958-59, estimates were available for 25 commodities produced by industrial enterprises and six commodities produced by handicrafts. Because of the deterioration in the quality of the items produced and the tendency of official sources to exaggerate achievements in production during the Leap Forward, published data were not accepted until they had been checked against other available information and adjusted as necessary. Specifically, "backyard" production of steel was not included in the physical output data, and the claims for production of coal were reduced to take account of exaggeration in the official data and the low calorific value of the coal. Although allowances were made, there may still be a small upward bias in the index for this period.

For the years 1960-65 estimates were available for only 10 commodities,¹⁰ and it was not possible to separate the production of industrial enterprises from that of handicrafts. Because these estimates are subject to a wider range of error than the data for earlier years and because the size of the sample is greatly reduced, the index for these years is less reliable than it is for the years before 1960. It should be regarded as providing only a general indication of the trend in production.

II. THE CONSTRUCTION OF THE INDEX

A. FOR THE YEARS 1949-59

Indexes showing the growth of production for individual branches of industry, for industry and handicrafts, and for total industrial production during the years 1949-59 are presented in table 6. The construction of these indexes is described below:

¹⁰ For estimates of the physical output of these commodities, see app. C.

TABLE 6.—*Derivation of the index of industrial production in Communist China, 1949-59*

[1956+100]

	1956 weights		1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total industrial production.....	100.00		27.17	34.35	45.62	56.06	70.15	80.18	80.69	100	109.36	143.78	181.60
Industry.....	100.00	84.79	21.84	29.00	41.22	53.13	65.18	75.96	78.81	100	111.00	149.81	192.41
Electric power.....	2.18		25.96	27.42	34.65	43.76	55.41	66.30	73.80	100	116.56	165.91	250.12
Coal.....	12.26		29.25	38.71	47.87	59.98	62.85	75.46	88.37	100	117.29	179.85	234.51
Petroleum.....	.92		10.40	17.20	26.23	37.49	53.48	67.84	83.06	100	125.37	194.67	318.14
Ferrous metals.....	5.96		3.73	12.24	21.28	34.48	46.24	54.93	69.07	100	133.28	189.44	264.06
Metal processing.....	19.96		14.83	21.76	35.28	43.80	51.14	60.88	62.64	100	105.53	163.72	204.21
Chemical processing.....	2.88		9.38	16.27	28.94	38.14	47.53	63.11	75.96	100	119.33	166.33	234.58
Building materials.....	9.82		10.34	22.06	38.95	44.75	60.64	71.95	70.44	100	107.30	145.47	191.93
Timber.....	5.83		25.09	29.75	35.20	53.04	83.32	105.88	100.11	100	134.14	168.98	199.63
Paper.....	1.21		14.82	19.29	33.03	50.98	58.56	71.07	78.79	100	125.19	166.87	233.10
Textiles.....	21.10		24.60	34.37	45.33	61.36	74.88	85.27	77.85	100	94.00	116.92	148.69
Food.....	17.88		35.17	36.75	52.39	64.48	78.98	85.62	93.17	100	116.17	127.32	152.96
Handicrafts.....	15.21		56.87	64.16	70.16	72.25	97.87	103.72	91.22	100	100.21	110.18	121.34

1. *Industry*

The index of production for industry was constructed from Chinese data on the physical output of 33 commodities produced by 11 branches of industry. These data were weighted in two 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—and each based on a single commodity. For the electric power, coal, timber, and paper industries, production is relatively homogeneous, and a single output series includes the entire production of the branch. For the ferrous metals industry, only the output series for the production of rolled steel was used. Although data were available for the production of iron and manganese ore, pig iron, and crude steel, these commodities were not included, because they are intermediate products which are almost entirely consumed within the industry. For the petroleum and the building materials industries, the only commodities for which data were available are crude oil and cement, respectively. The indexes for the remaining branches of industry—metal processing, chemical processing, textiles, and food—were based on a sample of the commodities produced by these branches weighted by their respective prices.

Construction of the index for the metal processing industry presented a special problem. The metal processing industry is divided into the machine building, the metal products, and the repair subbranches, but the commodities for which output data are available were all produced by the machine building subbranch. These commodities cannot be considered typical of the metal processing industry as a whole, because machine building grew half again as fast as metal products and repair during the First Five-Year Plan.

For the years 1952–57 the index for the metal processing industry was constructed in two steps. First, an index for the machine building subbranch was calculated from the physical output data, and, second, this index was adjusted for coverage on the basis of the reported gross value data for the machine building subbranch and for the metal processing industry as a whole. For the years 1949–51 and 1958–59 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 machine building subbranch as a whole. For the years 1949–51 the index was computed by adjusting the official data to allow for the difference in the rates of growth showing during the First Five-Year Plan by the official index of gross value and the estimated index of value added. For the years 1958–59 it was assumed that production increased at one-half of the officially claimed rate of growth, because the upward bias in the official data on the gross value of industrial production increased markedly during the Leap Forward.

In the second stage of aggregation an index for industry as a whole was obtained by combining the indexes for the individual branches. The weights employed for the aggregation of the branch indexes were estimates of the values added in 1956 that were computed from wage bill paid to workers employed in industry. The wage bill was computed from data on average earnings and average employment. If

data on the wage bill had been available in sufficient detail, the value added per unit of output could have been used directly as the weight for each commodity, but these data were available only for branches of industry, not for individual commodities.

2. Handicrafts

The index of handicraft production was constructed from Chinese data on the physical output of eight commodities. For the years 1949-57 these data were weighted by their respective prices. The years 1958 and 1959 presented a special problem because the output data for coal and pig iron include the output produced by mass campaigns and are not comparable to the output data for the earlier years. For these years the index was constructed in two steps. First, an index was constructed based on the six commodities for which output data comparable to that for the earlier years are available; and second, this index was adjusted to allow for the difference between its rate of growth and that shown by the full index of handicraft production described above.

3. Total Industrial Production

In the third stage of aggregation the index of total industrial production was obtained by combining the indexes for industry and handicrafts. 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. A separate estimate of the values added by industry and handicrafts is presented in table 7. This estimate is based on an adjustment of Chinese Communist data for the net value of total industrial production in 1955.

TABLE 7.—Derivation of the value added weights for industry and handicrafts

	Industry	Handicrafts	Total
Value added in 1955:			
Million 1952 yuan ¹	15,266	3,170	.....
Index (1956=100) ²	78.81	91.22	.....
Value added in 1956:			
Million 1952 yuan ³	19,371	3,475	22,846
Weights (percent)	84.79	15.21	100

¹ Derived from data on the net value of total industrial production presented in Li Hui-hung, Sung Chi-jen, and Wang Hua-hsien, "Our Views on the Classification of Light and Heavy Industry," *Tung-chi kung-*ts*o* (Statistical Work), No. 18, 1957, p. 15.

² Table 6.

³ Value added in 1955 divided by the index numbers.

B. FOR THE YEARS 1960-65

The derivation of the index of total industrial production for the years 1960-65 is presented in table 8.

The system of weights used to calculate the index for the years 1949-59 was not used for years 1960-65 because handicraft production could not be separated from the production of industrial enterprises and because the number of physical output series for which estimates are available was greatly reduced. For example, no complete output series is available for the metal processing industry and only a single series is available for such important branches of industry as textiles

TABLE 8.—Derivation of the index of industrial production in Communist China, 1960-65

[1956=100]

Year	Sample output data ¹	Total industrial production ²
1959.....	197.34	181.60
1960.....	207.62	188.55
1961.....	138.94	124.52
1962.....	123.96	109.64
1963.....	138.25	120.67
1964.....	156.62	134.91
1965.....	173.65	147.63

¹ Derived from the estimates of physical output presented in app. B.² Calculated from the formula:

$$I_i = \frac{1+\alpha}{1+\beta} \times \frac{I_i'}{I_{i-1}'} \times I_{i-1}$$

where I represents the index of total industrial production, I' represents the index computed from the sample output data, and α and β represent the average annual rates of growth during the years 1953-57 of the index of total industrial production and of the sample index, respectively. The value of the index of total industrial production in 1959 is from table 6, and the values of α and β are 0.1430 and 0.1532, respectively. (For a more complete description of this formula, see Norman M. Kaplan, and Richard H. Moorsteen, *Indexes of Soviet Industrial Output*, Santa Monica, 1960, pp. 61-63.)

and food. The procedure used was to weight the 10 series for which estimates of physical output are available by their respective prices, and then to adjust the resulting index for the difference between its rate of growth and that shown by the index of total industrial production for the years 1953-57. The details of this adjustment are shown in table 8.

APPENDIX B

Sources of Data on Industrial Production in Communist China

The sources of data on industrial production in Communist China are: (a) reports of the State Statistical Bureau; (b) articles in official newspapers and journals; (c) speeches by leading Government and Party officials; (d) Soviet articles and commentary on the Chinese Communist economy; and (e) reports by diplomats, scholars, and travelers who have visited statistical offices, industrial ministries, and industrial plants.

In the period of economic rehabilitation (1949-52), when there was as yet no national statistical system and when the regime's statistical knowledge extended barely beyond the "commanding heights" of the economy, almost no data on the production of industrial commodities were published. There were no annual statistical reports, and the scattered data that were released are confusing and frequently contradictory.

In the period of the First Five-Year Plan (1953-57), a determined effort was made to improve the coverage and the quality of the statistical data. Statistical offices were organized, and a standardized statistical reporting system was introduced. The State Statistical Bureau itself was organized in the fall of 1952, and local statistical offices were opened in the Provinces and major cities during 1953 and in the *hsien* during 1954. The standardized statistical reporting was

intended to provide complete statistical coverage, but at first it was effective only in those state and joint state-private enterprises that were operated by the ministries of the central government. The reporting system, however, was expanded gradually and included all industrial enterprises by the end of 1956.

The first annual communique of the State Statistical Bureau was issued in 1953. The data presented on the production of industrial commodities were for the state and joint state-private enterprises only and were given in the form of index numbers or percentage increases rather than as absolute numbers. Indexes for the years 1949-52 were presented for 15 commodities and percentage increases in 1952 for an additional 15 commodities. In 1954, a communique was issued for 1953 and the communique for 1952 was revised, but no absolute data on the production of industrial commodities were included.

The year 1955 emerges as a turning point in the quantity and quality of statistical data produced. The 1954 communique of the State Statistical Bureau (published in 1955) still presented production claims in the form of percentage increases, but a short statistical abstract was published for the first time. This abstract contained absolute data on the production of 14 industrial commodities for the pre-Communist peak year, for 1949, and for 1952-54. And, finally, the *First Five-Year Plan for Development of the National Economy of the People's Republic of China* was published in August 1955. The plan contained data on the production of 46 industrial commodities, the largest number to be included in any single source. These data were on production in 1952 and targets for 1957. Annual communiques and statistical abstracts for 1955 and 1956 were also published in 1956 and 1957, respectively.

In the period of the Leap Forward (1958-60), reliable statistics continued to be published for the years through 1957. The two most reliable sources of information on industrial production in Communist China were both published during this period. They are: State Statistical Bureau, industrial statistics section, *Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chih-hsi* (*Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries—Past and Present*), Peiping, 1958; and State Statistical Bureau, *Wei-ta ti shih-nien* (*The Ten Great Years*), Peiping, 1959. The data released for the years 1958-60, however, are not of the same quality as those released for the earlier years, and after 1958 the number of commodities for which data are available decreased rapidly. Targets and claims were doubled and redoubled, and the data for this period had to be discounted heavily in important cases.

Since the 2nd Session of the 2nd National People's Congress met in April 1960, no significant body of statistical data has been published. The regime admitted in December 1960 that major light industrial commodities which depend on agriculture for raw materials, such as cotton textiles, vegetable oils, sugar, and cigarettes, would fall short of their targets for the year, but claimed that targets for heavy industrial commodities would be overfulfilled, and that industrial production on the whole had continued its Leap Forward. Actual data, however, were not released.

In the period of recovery and readjustment (1961-65), data on industrial production were extremely scarce. The single most important source of information during this period was Chou En-lai's speech to the 1st Session of the 3rd National People's Congress on December 21-22, 1964. In this speech, Chou claimed that the output of eight major industrial commodities—steel, petroleum, chemical fertilizers, cement, motor vehicles, cotton yarn, sugar, and cigarettes—all increased by at least 20 percent over the level of 1963. These claims must be treated with caution; for example, in the same speech Chou claimed that the gross value of industrial output increased by only 15 percent.

Fortunately, we do not have to depend entirely on the publication of official production data. Estimates for the output of various industrial commodities in this period have been made by scholars and other specialists. These estimates are based on material gathered from a variety of sources, such as travel in China, interviews with Chinese refugees, and meticulous examination of the fragmentary information released by the Chinese Communist regime. The estimates for individual industrial commodities vary considerably, but they all present a picture of collapse followed by gradual recovery.

The Soviet Union has also started to publish its estimates of the output of industrial commodities in Communist China. Since the Sino-Soviet dispute, Soviet authors no longer have the benefit of special access to Chinese sources, but their estimates are useful because they are derived independently. The Soviet estimates show the same pattern of collapse and recovery shown by the estimates of Western scholars. Both the Soviet and the Western estimates are reproduced in appendix C.

No volume on the Third Five-Year Plan (1966-70) had been published as of October 1966. No base figures for 1965 or targets for 1970 have been released, and there have not even been references to the percentage increases planned for the 5-year period. On October 1, 1966, however, it was claimed that industrial production in the first 8 months of 1966 increased by 20 percent over the corresponding period of last year and that the increase in the output of various industrial commodities ranged from 40 to 200 percent. These claims, in some ways reminiscent of those made during the Leap Forward, appear to be unreasonably high, but cannot be evaluated until a larger body of data has been collected.

APPENDIX C

TABLE 9.—*Alternative estimates of physical output, 1957-65*

	1957	1958	1959	1960	1961	1962	1963	1964	1965
Electric power (million kilowat-hours):									
Ashton ¹	19,340	27,500	41,500	47,000	31,000	30,000	33,000	36,000	40,000
<i>Current Scene</i> ²	19,300	27,500	-----	47,000	-----	30,000	31,000	32,000	-----
Department of State ³	-----	-----	-----	-----	-----	-----	-----	-----	40,000
<i>Soviet Encyclopedia</i> ⁴	19,340	-----	41,500	-----	-----	-----	-----	55,000	-----
<i>Soviet Handbook</i> ⁵	-----	-----	-----	-----	-----	-----	37,500	-----	-----
Author's estimate.....	19,340	27,530	41,500	47,000	31,000	30,000	33,000	36,000	40,000
Coal (thousand metric tons):									
<i>Current Scene</i> ²	130,000	270,000	-----	425,000	-----	190,000-200,000	210,000	220,000	-----
Department of State ³	-----	-----	-----	-----	-----	-----	-----	-----	230,000
<i>Soviet Encyclopedia</i> ⁴	130,000	-----	347,800	-----	-----	-----	-----	209,000	-----
<i>Soviet Handbook</i> ⁵	-----	-----	-----	-----	-----	-----	265,000	-----	-----
Wang ⁶	-----	-----	347,800	420,000	250,000	250,000	-----	290,000	-----
Author's estimate.....	130,730	226,400	292,400	325,000	180,000	180,000	100,000	200,000	210,000
Crude oil (thousand metric tons):									
<i>Current Scene</i> ²	1,460	2,260	-----	4,500	-----	5,300	5,900	6,000-7,000	-----
Department of State ³	-----	-----	-----	-----	-----	-----	-----	-----	8,000
<i>Soviet Encyclopedia</i> ⁴	1,450	-----	3,700	-----	-----	-----	-----	8,400	-----
<i>Soviet Handbook</i> ⁵	-----	-----	-----	-----	-----	-----	6,500	-----	-----
Wang ⁶	-----	-----	3,700	5,500	6,200	6,800	7,500	8,500	-----
Author's estimate.....	1,460	2,260	3,700	4,500	4,500	5,300	5,900	7,000	8,000
Crude steel (thousand metric tons):									
American Iron and Steel Institute ⁷	-----	-----	13,350	18,450	12,000	7,300	7,500	-----	-----
<i>Current Scene</i> ²	5,350	8,000	-----	18,450	-----	7,000-8,000	7,000-9,000	8,000-10,000	-----
Department of State ³	-----	-----	-----	-----	-----	-----	-----	-----	11,000
Fedorov ⁸	-----	-----	-----	-----	-----	-----	-----	-----	10,000
<i>Soviet Encyclopedia</i> ⁴	5,350	-----	13,350	-----	-----	-----	-----	9,500	-----
<i>Soviet Handbook</i> ⁵	-----	-----	-----	-----	-----	-----	9,500	-----	-----
Wang ⁶	-----	-----	13,350	18,450	9,500	10,000	12,000	14,000	-----
Author's estimate.....	5,350	8,000	10,990	15,220	12,000	8,000	9,000	10,000	11,000
Chemical fertilizer (thousand metric tons):									
<i>Current Scene</i> ²	800	1,240	-----	2,480	-----	2,120	2,800-3,000	3,400-3,600	-----
Liu ⁹	871	1,462	1,777	2,000	1,447	2,170	2,916	-----	-----
Wu, <i>et al.</i> ¹⁰	764	984	1,333	1,675	1,431	2,050	2,600	-----	-----
Author's estimate.....	803	1,354	2,000	2,480	1,450	2,120	3,000	3,600	4,600

See footnotes at end of table.

TABLE 9.—Alternative estimates of physical output, 1957-65—Continued

	1957	1958	1959	1960	1961	1962	1963	1964	1965
Cement (thousand metric tons):									
<i>Current Scene</i> ²	6,860	9,300		13,500		6,000	7,000	8,000	
<i>Soviet Encyclopedia</i> ³	6,860		12,300					11,500	
<i>Soviet Handbook</i> ⁴							7,500		
Wang ⁵				13,500	8,000	8,000	10,000	10,500	
Author's estimate.....	6,860	9,300	12,270	13,500	6,000	6,000	7,000	8,000	9,000
Timber (thousand cubic meters):									
Food and Agricultural Organization ¹¹							32,000	34,000	
Richardson ¹²	28,000	35,000	40,000	39,000	34,000	29,000			
Author's estimate.....	27,870	35,000	41,200	33,000	27,000	29,000	32,000	34,000	36,000
Paper (thousand metric tons):									
Food and Agricultural Organization ¹¹			2,130	2,800	2,600	2,700	2,850		
Author's estimate.....	1,221	1,630	2,130	2,130	1,000	1,000	1,100	1,500	1,500
Cotton cloth (million linear meters):									
<i>Current Scene</i> ²	5,000	5,700		7,600		3,000-3,300	3,300-3,600	4,000-4,500	
Author's estimate.....	5,050	5,700	7,500	6,000	3,000	3,000	3,300	3,600	3,900
Sugar (thousand metric tons):									
<i>Current Scene</i> ²				1,260	1,200		740	1,050	
International Sugar Council ¹³			1,260	1,260	1,200	1,300	1,300	1,840	
Author's estimate.....	864	900	1,130	920	700	480	540	1,100	1,500

¹ John Ashton, "Development of Electric Energy Resources in Communist China," 1966. Paper contributed to the Joint Economic Committee.

² "Decision for an 'Upsurge'," editor, *Current Scene*, vol. III, No. 17, Apr. 15, 1965.

³ U.S. Department of State, *Indicators of Comparative East-West Economic Strength*, 1965, Oct. 1, 1966.

⁴ U.S.S.R., *Yezhegodnik bol'shoy sovet'skoy entsiklopedii: 1965 (1965 Yearbook of the Great Soviet Encyclopedia)*, Moscow, 1965, p. 283.

⁵ U.S.S.R., Academy of Sciences, Institute of World Economics and International Relations, *Mirovaya ekonomika: kratiy spravochnik (World Economy; A Short Handbook)*, 2d edition, Moscow, 1965, pp. 28-29.

⁶ K. P. Wang, "The Mineral Industry of Mainland China," *Minerals Yearbook*, U.S. Bureau of the Mines, 1963 and 1964.

⁷ American Iron and Steel Institute, *Foreign Trade Trends; Iron and Steel*, New York, 1964.

⁸ F. Fedorov, "The Chinese People's National Holiday," *Izvestiya (News)*, Oct. 2, 1966.

⁹ Jung-chao Liu, "Fertilizer Application in Communist China," *The China Quarterly*, October-December 1965.

¹⁰ Yuan-li Wu, Francis P. Hoerber, and Mabel M. Rockwell, *The Economic Potential of Communist China*, vol. 3, 1964, p. 34.

¹¹ UN, Food and Agriculture Organization, *Yearbook of Forest Products Statistics*, 1961, 1962, 1963, 1964, and 1965.

¹² S. D. Richardson, *Forestry in Communist China*, Baltimore, 1966, p. 166.

¹³ International Sugar Council, *Statistical Bulletin*, July 1965.

APPENDIX D

TABLE 10.—*Indexes of industrial production for selected countries, prewar, and 1949-65*

[1956=100]

	Soviet Union ¹	Japan ²	Communist China ³	India ⁴
Prewar ⁵	36.1	64.6	37.1	58
1949.....	46.8	32.5	27.2	67
1950.....	53.6	39.4	34.3	66
1951.....	61.3	53.8	45.6	74
1952.....	67.1	57.7	56.1	76
1953.....	73.8	69.7	70.2	78
1954.....	82.1	75.5	80.2	83
1955.....	91.3	81.7	80.7	92
1956.....	100.0	100.0	100.0	100
1957.....	109.1	116.3	109.4	104
1958.....	119.8	114.7	143.8	107
1959.....	132.0	137.5	181.6	117
1960.....	142.2	171.2	188.5	130
1961.....	153.5	204.3	124.5	139
1962.....	166.0	221.1	109.6	150
1963.....	177.5	243.3	120.7	164
1964.....	189.6	284.6	134.9	175
1965.....	203.3	293.1	147.6	184

¹ James H. Noren, "Soviet Industry Trends in Output, Inputs, and Productivity," Joint Economic Committee of the U. S. Congress, *New Directions in the Soviet Economy*, Washington, 1966, p. 280, except for the prewar year. The index selected is the aggregate industrial production with the growth in the gross value of output of machine building and metal working discounted by 20 percent. For the prewar year, the Noren index was linked with the index in Norman M. Kaplan and Richard H. Moorsteen, *Indexes of Soviet Industrial Output*, Santa Monica, 1960, p. 235.

² The Bank of Japan, *Economic Statistics of Japan*, 1964, Tokyo, 1965; and Office of the Prime Minister, Bureau of Statistics, *Monthly Statistics of Japan*, August 1966.

³ Appendix A, except for the prewar year. For the prewar year, I linked my index with the index in Liu Ta-chung and Yeh Kung-chia, *The Economy of the Chinese Mainland: National Income and Economic Development, 1935-1959*, Princeton, 1965, p. 66.

⁴ United Nations, *1963 Statistical Yearbook*; India, Ministry of Finance, *India: Pocket Book of Economic Information*, Delhi, 1964 and 1965; Indian Institute of Public Opinion, *Monthly Commentary on Indian Economic Conditions*, September 1966, p. 22.

⁵ The year is 1937, except for Communist China. The year for China is 1933.

DEVELOPMENT OF ELECTRIC ENERGY RESOURCES IN
COMMUNIST CHINA

BY

JOHN ASHTON

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DEVELOPMENT OF ELECTRIC ENERGY RESOURCES IN COMMUNIST CHINA

I. ELECTRIC ENERGY RESOURCES IN COMMUNIST CHINA

Communist China is one of the most highly endowed countries of the world in terms of energy resources for the development of electric power generation. The hydroelectric and coal resources compare favorably with those in the United States and the U.S.S.R.; the country is less favorably endowed with petroleum and natural gas resources.

A. HYDROELECTRIC RESOURCES

1. *The River Systems of Communist China* [1, 10]¹

China has an extensive river system. In general, the rivers begin high in the mountains in the western regions of the country, and flow in an easterly direction toward the Pacific. In their upper reaches they descend through narrow valleys, forming many waterfalls and rapids, but in their eastern reaches they traverse low flood plains. North of the Chinling Mountains and the Yellow River² the mean annual precipitation is about 20 inches, and to the south, about 50 inches. In most districts of the country, the major part of the precipitation occurs in the summer. There is considerable flooding during July and August.

The principal water power resources are concentrated in the southwest and central Provinces of Communist China, which are inadequately supplied with other types of power resources. In southwest China are to be found 72 percent of the water power resources of the country, primarily in the upper Yangtze River and the Brahmaputra River which rises in Tibet. Twelve percent of the hydro resources of Communist China are found in the central Provinces, mostly in the basins of the Yellow River (Huang-ho) and the Hsi-kiang. The principal resources of nonferrous metals, and considerable supplies of iron ore are found in these regions. Table 1, following, shows the water power resources of the principal rivers in Communist China.

The Yangtze is the most important water artery of China. The entire basin covers 740,000 square miles, and the total length of the river and its tributaries is 40,000 miles. The average annual runoff is reported to exceed 30 trillion cubic feet, and the annual mean discharge amounts to over a million cubic feet per second. The main channel of the Yangtze can be divided into three parts. From the source to I-pin, where it enters the Szechwan basin, the river drops 15,700 feet in 840 miles. From I-pin and I-chang, where it comes out on to the lowlands, the Yangtze drops 710 feet in 630 miles; from I-chang to the mouth it drops only 130 feet in 1,120 miles.

¹ Referenced sources may be found listed in the appendix to this chapter, p. 316.

² See map, following.

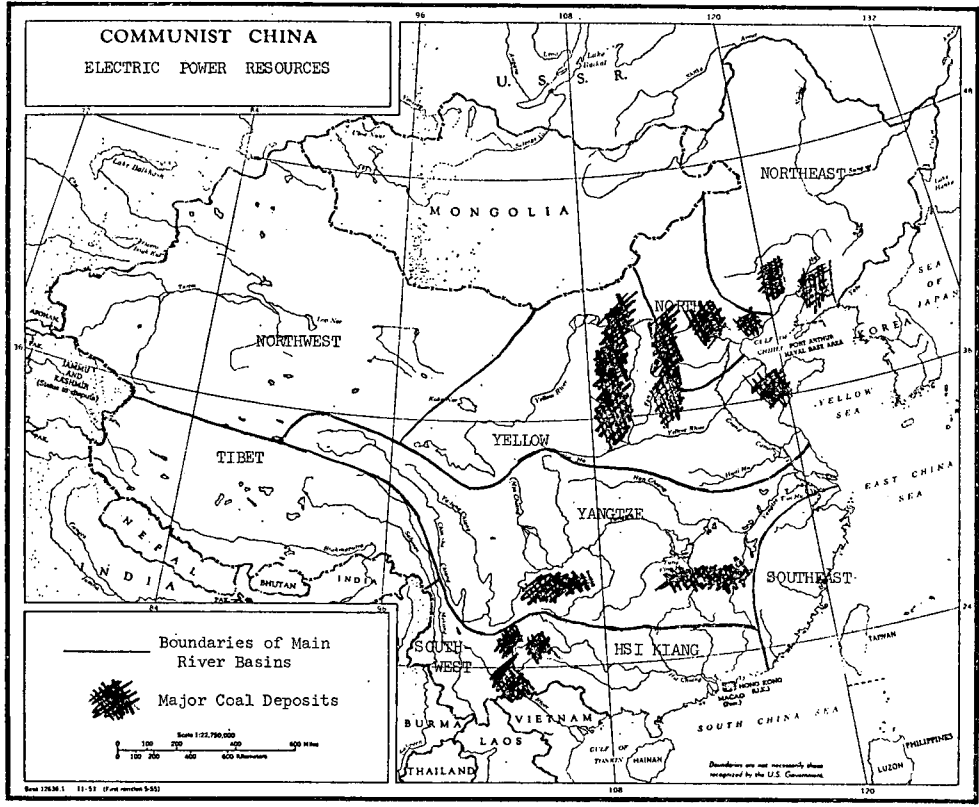


TABLE 1.—*Water power resources of Communist China's river systems*¹

Area or river system	Resources	
	Million kilowatts	Percent
Yangtze Basin ²	217.15	40.5
Tibetan rivers ²	117.27	21.9
Brahmaputra ³	(105.00)	-----
Southwest rivers ²	90.69	16.9
Yellow River (Huang-ho) Basin.....	32.74	6.1
Hsi-kiang Basin.....	28.55	5.3
Southeast coastal rivers.....	² 11.76	2.2
Northeast rivers.....	18.90	3.5
Northwest rivers (excluding Yellow River).....	17.53	3.3
Northern rivers (excluding Yellow River).....	1.22	0.2
Total.....	⁴ 535.81	100.0

¹ See references in appendix, p. 316.

² The rivers of the southwest region of Communist China include the upper and middle Yangtze, the Tibetan rivers, and other rivers that the Communist Chinese designate as "southwest rivers." All the rivers of the southwest region make up 72 percent of the hydroelectric resources of the country. The lower Yangtze, which is a part of the river system of the Yangtze Basin but not in the southwest region, accounts for about 7 percent of the hydroelectric resources of the country.

³ That portion of the Brahmaputra River located in Tibet. The large potential is primarily a result of the large drop in elevation from the source to the border.

⁴ Communist Chinese sources include 8,700,000 kilowatts of hydroelectric potential on the island of Taiwan within the resources of southeast coastal rivers and the total for the country, bringing total resources to 544,510,000 kilowatts. The resources of Taiwan have been excluded in this study.

The Yellow River is the second river in Communist China in size. The drainage basin covers about 300,000 square miles, but the water carrying capacity is considerably less than the Yangtze, as much of the basin lies north of the main rainfall areas. The mean annual runoff is only 5 percent of that of the Yangtze.

2. *Problems in the Utilization of Hydroelectric Resources* [1]

The rivers of China, as a rule, have abundant water runoff. They begin high in the mountains in the western regions of China and descend through narrow valleys and gorges with hard rock foundations, forming many waterfalls and rapids. These natural features facilitate the construction of hydroelectric stations in the western part of the country, and permit the construction of considerable capacity with a relatively small amount of construction work.

The irregular flows of Chinese rivers present many problems in their utilization for power generation. Large seasonal fluctuations in flow are caused primarily by uneven distribution of precipitation. In winter there is generally a large drop in flow; in spring there is a sudden but not very large rise resulting chiefly from snow melting in the mountains; during the summer rains 60-70 percent of the annual precipitation takes place. As the watersheds of China's rivers have been highly eroded, with limited natural vegetative cover, the level of floodwaters in this period is usually very high.

The floodwater flow of many Chinese rivers exceeds the flow during other periods by 10-1,000 times. As a result, during great floods there is a threat to hydraulic installations, and during periods of low water the flow is usually inadequate for operating hydroelectric stations at designed capacity. The efficient use of Chinese rivers for production of electricity therefore requires artificial regulation of the flow of the rivers by means of series of reservoirs.

Another major problem in the way of power generation on the rivers of Communist China is the silting problem. This problem is greatest on the Yellow River (whence its name). Each year the Yellow River carries an average of over 40 billion cubic feet of suspended material. Part of the silt is deposited in the riverbed, raising it above the surrounding countryside by 10-20 feet. It can only be held within its banks by ever-higher levees. The silt runoff of the Yangtze is over 10 billion cubic feet of suspended material per year, but because of its greater flow, suspended material makes up only 0.5 percent of the total flow.

Any rational development of the hydroelectric resources of the rivers of Communist China would also have to consider their uses as a means of navigation and as sources of water for irrigation.

From earliest times, the rivers of China have been used for navigation. Most Chinese rivers have a relatively deep channel, and do not freeze in winter. For this reason, nearly every province has a complex river system, suitable for year-round navigation. The total length of inland waterways suitable for navigation is better than 55,000 miles. About one-third of this length is navigable by steam- and diesel-driven vessels. When we consider that the total length of the entire railroad system of Communist China is only 22,000 miles, the enormous importance of the rivers as transportation arteries of the country is apparent.

The rivers of China also play an important role in the irrigation of cultivated land. In 1964, more than 100 million acres out of a total of 260 million cultivated acres were under irrigation.

B. COAL [1, 2, 3]

Coal furnishes by far the greatest portion of the primary energy utilized in Communist China. It is reported to comprise 66 percent of the fuel and power balance of the country. Most of the remainder is composed of brushwood, rice husks, dung, and other local and rural noncommercial fuels. Coal supplies well over 90 percent of the commercial primary energy utilized in Communist China.

1. Reserves

Communist China is probably third in the world in coal reserves, after the United States and the Union of Soviet Socialist Republics. Geological prospecting during the early years of the Communist regime was the basis for their estimate that total possible coal reserves amount to 1,500 billion tons.³ Only 70-80 billion tons of this amount, however, have been investigated and are regarded as exploitable at the present time. This amount is sufficient for at least a century for any possible rate of industrial growth.

Qualitatively, Chinese coal is for the most part fair to good; with a calorific value of 12,000 to 13,000 B.t.u. per pound, an ash content of 4 to 15 percent, and a relatively low sulfur content. However, due to the lack of adequate cleaning facilities, fuel delivered to the customer is often of much lower quality. A large part of the Chinese coal reserves are bituminous, and to a lesser degree anthracite. Low grade lignites make up only 10 percent of the reserves.

³Tonnages in this study are given in metric tons, as used in Communist China.

In many regions of Communist China coal outcrops to the surface and can be mined by low cost open pit methods. Coal seams in the North are generally thicker, in one instance known to reach 400 feet. The deposits south of the Yangtze are smaller, with relatively thin seams, and more difficult mining conditions.

Although the coal deposits are present in all provinces of China, the largest deposits are concentrated in the northern part of the country. Almost half of the total coal reserves of China are located in Shansi province.

Table 2, following, presents data on the estimated reserves, production, and consumption of coal in the several regions of Communist China in 1957, the last year for which comparable information is available.

TABLE 2.—Regional distribution of coal reserves, production, and consumption in Communist China, 1957¹

Region	Estimated reserves		Production		Consumption		Net balance	
	Billion tons	Percent	Million tons	Percent	Million tons	Percent	Export	Import
Northeast.....	40.2	2.7	43.1	33.0	42.8	33.0	0.3	-----
North.....	1,051.2	70.1	43.7	33.4	31.5	24.2	12.2	-----
Northwest.....	280.7	18.7	5.3	4.1	9.2	7.1	-----	3.9
Of which Inner Mongolia.....	(69.3)	(4.6)	-----	-----	(2.6)	(2.0)	-----	-----
Southwest.....	49.2	3.3	11.1	8.5	11.2	8.6	-----	.1
Center-south.....	56.3	3.7	11.7	9.0	17.2	13.2	-----	5.5
East.....	22.4	1.5	15.7	12.0	18.1	13.9	-----	2.4
Total ²	1,500.0	100.0	130.7	100.0	130.0	100.0	.7	-----

¹ See source references 4, 5, 22, appendix.

² May not always be the sum of the parts, because of rounding.

2. Production [1, 2, 6, 22]

The development of China's coal production was very slow until the Communist takeover in 1949. During the 1930's production ranged between 25 and 30 million tons a year. Under the impetus of the development of Japan's war economy in Manchuria, production grew to 62 million tons in 1942, but then declined to 14 million tons in 1948. Reconstruction of industry in Communist China pushed production to 64 million tons in 1952.

During the First Five-Year Plan production of coal in Communist China grew from 67 million tons in 1953 to 130 million tons in 1957. The increase in coal extraction in the First Five-Year Plan came chiefly as a result of the expansion and reconstruction of existing enterprises. More than 85 percent of the coal was obtained from old mines.

During the Leap Forward production of coal was reported by the Communist Chinese to have jumped to 270 million tons in 1958, 348 million tons in 1959, and 425 million tons in 1960. This increase was made possible by increasing production at existing mines, and by opening many small "native" mines throughout the country. The production at the large mines was probably reported reasonably

accurately, although there is much evidence that the totals included a lot of rock and poorer grades of coal that would not normally be mined or included in production totals. The approximately 80 million tons of coal produced in native mines in 1960 are probably only inflated guesses of the production by a large number of Chinese with pick and shovel. Much of this native coal probably replaced a lot of the straw, twigs, dung and other lowgrade fuels used for local household consumption in the countryside, and did not enter industrial channels.

Production of coal in Communist China since 1960 has not been reported officially, but lies somewhere between the 1957 and 1958 levels. Hong Kong observers estimate production in 1963 and 1964 at 190 and 200 million tons, respectively. Production in 1965 was probably about 210 million tons.

3. *Costs*

Coal delivered to the power station in Communist China cost on the average 26 cents per million B.t.u.'s in 1956. This low price is a reflection of the low price of labor in this labor-intensive industry in Communist China. The price of coal per B.t.u. increased in 1960 to about 35 cents per million B.t.u.'s, as the quality of coal deteriorated and the cost per ton delivered remained the same. It is unlikely that the quality of coal had in 1965 yet returned to the 1956 levels.

4. *Consumption*

The rapid development of the Communist Chinese economy in the years 1952-60 was accompanied by a correspondingly rapid growth in the consumption of coal. The most significant trend in this growth was the increasing share of consumption of coal by industry (excluding public utility power stations), which increased from 22 percent of net domestic sales in 1952, to 30 percent in 1957 and over 40 percent in 1960. Industrial sales grew more rapidly than retail sales, most of which are for domestic space heating. The share of retail sales declined from 60 percent in 1952, to 53 percent in 1957 and 33 percent in 1960. Consumption by public utility power stations grew from 5 percent of the total in 1952, to 9 percent in 1957, and 13 percent in 1960. This growing share was a result not only of growth in power generation by public utility thermal power stations, but also of rapid growth of commercial heat sales from the public utility power stations, Table 3, following, presents data on the consumption of coal by the main categories of consumers.

Since 1960 the consumption of coal has fallen, along with other industrial activity. While no data are available concerning the consumption of coal by various categories of consumers in 1965, distribution of the approximately 210 million tons available would appear to have been about as indicated in table 3.

C. PETROLEUM [2, 4, 6, 22]

Although Communist China is well endowed with coal and hydroelectric resources, it is short in oil, oil shale, and natural gas. Prospecting for new resources has been stepped up greatly under the Communists. According to Communist Chinese reports, proven reserves of

TABLE 3.—Consumption of coal in Communist China

[In millions of tons]

	1952 ¹	1957 ¹	1960 ²	1965 ³
Industry.....	12.7	37.9	130	70
Metallurgy.....	4.8	12.7	60	30
(Including coking coal).....	(3.2)	(8.2)	(30)	(20)
Coal mining.....	1.8	4.2	70	40
Other industry ⁴	6.1	21.0		
Public utility power stations.....	3.0	11.2	40	30
Transport.....	7.0	10.8	30	20
Railroads.....	6.7	9.8		
River and coastal shipping.....	.3	1.0		
Commercial sales.....	35.1	67.7	100	80
Home consumption.....	25.2	56.5	80	60
Other.....	9.9	11.2	20	20
Net domestic sales ⁵	58.0	127.0	300	200
Losses, net changes in stocks, local handcraft consumption from own production, net exports and statistical discrepancy ⁶	8.5	3.7	125	10
Total production.....	66.5	130.7	7425	⁷ 210

¹ See source references 1, 4, appendix.² From source reference 2, p. —, appendix, rounded to the nearest 10,000,000 tons.³ Approximation, rounded to the nearest 10,000,000 tons.⁴ Including industrial power stations.⁵ Figures are as reported and may not always add to the total because of rounding.⁶ Residual.⁷ Much of this amount is of highly dubious quality, if indeed it was actually produced.⁸ See source reference 22, p. 316, appendix.

natural petroleum amount to 2 billion tons. Reserves of oil shale are reckoned at 60 billion tons, from which about 3.9 billion tons of liquid fuel can be extracted. No estimates of reserves of natural gas have been publicized.

Natural petroleum resources are concentrated chiefly in Sinkiang, Kansu, and Tsinghai in the northwest, Szechwan in the southwest, and Heilungkiang in the northeast. More than 90 percent of China's petroleum is found in these areas, with Sinkiang accounting for a reported 60 percent. The most important oil shale resources are found in the northeast, and in Kwangtung Province in the south. Natural gas is found mainly in Szechwan.

Production of natural petroleum did not reach 1 million tons until 1956, and was planned to be 5 million tons in 1960. Output was about 6 million tons in 1963, 7 million tons in 1964, and 8 million tons in 1965. Two shale oil plants in the northeast at Fu-shun produce an additional 1 million tons a year. Communist Chinese claims that they are self-sufficient in petroleum thus reflect their low level of demand.

II. ORGANIZATION OF THE ELECTRIC POWER INDUSTRY [3, 16]

The Central Government in Communist China controls almost all the generation of electric energy and the construction of electric power facilities. The larger and more important power stations and the power transmission networks are under the Ministry of Water Conservancy and Electric Power. This Ministry was formed in 1958 by the merger of separate ministries of electric power and water conservancy. The merger was designed to simplify control of large multi-

purpose projects for flood control, irrigation, and power generation. The Ministry has three main functions: construction of thermal power stations and transmission lines; construction of hydroelectric stations and water conservancy projects of regional importance; and operation of regional electric power systems and power stations.

Smaller electric power stations at industrial establishments are under the control of the industrial ministries responsible for the parent plant. The small municipal electric power stations and those used for rural electrification are under the control of the provincial, county, and municipal commissions.

In Communist China, as in other Communist countries, the electric power industry sells at wholesale to large industrial enterprises, to municipal governments, to rural communes, and other types of large light and power consumers, who have their own substation. Each municipality has a utilities commission, which distributes the electricity—purchased from the electric power industry—over low-voltage distribution networks to individual households and other small light and power consumers. These municipal utilities maintain street lights, distribute heat and water, and perform the billing responsibilities of the electric utility industry in the United States, but they are not considered to be part of the electric utility industry in Communist China.

III. DEVELOPMENT OF THE ELECTRIC POWER INDUSTRY

A. CAPACITY, INVESTMENT, AND GENERATION [1, 2, 3, 7, 8, 9]

1. Status at the Communist takeover, 1949

In spite of the wealth of electric power resources in China, development of these resources has been very slow. During the early part of the 20th century development of electric power stations took place largely along the seacoast, in the large trading and manufacturing cities. Most of these plants were built by Western countries. In the 1930's Japan started building power stations in Manchuria to support its exploitation of the resources of that area. By the end of 1944, the installed capacity of powerplants in China was 3.1 million kilowatts (kw); 55 percent of this amount was to be found in Japanese plants in Manchuria, 20 percent in Japanese plants located in China proper, 10 percent in plants in the seacoast towns owned by Western European companies and 15 percent in scattered, small plants owned by Chinese. Much of the capacity was in small powerplants, with a capacity of less than 3 megawatts, and the annual utilization factor was about 26 percent. During their occupation of Manchuria, the Japanese built three hydroelectric power stations.

Between 1944 and 1949, war and civil war in China, and Soviet removals of over a million kilowatts of generating equipment in Manchuria put large numbers of powerplants out of operation, so that by the time of the Communist takeover in 1949 only 1.8 million kw were still operating.

Tables 4 and 5, following, present data on the capacity of power stations and generation of electric energy in Communist China in 1949, 1952, and 1956-65.

TABLE 4.—*Installed capacity of electric power stations in Communist China*¹

[In millions of kilowatts at the end of the year]

Year	Hydro	Thermal	Total
1949 ²	0.2	1.6	1.8
1952 ³	.2	1.8	2.0
1956	.8	2.8	3.6
1957 ⁴	1.0	3.5	4.5
1958	1.2	5.1	6.3
1959	1.6	7.9	9.5
1960 ⁵	2.0	8.9	10.9
1961	2.2	9.7	11.9
1962	2.4	10.1	12.5
1963	2.5	10.2	12.7
1964	2.6	10.3	12.9
1965	3.0	10.5	13.5

¹ See source references 1, 2, 3, 7, appendix.² Communist takeover.³ Beginning of First Five-Year Plan.⁴ End of First Five-Year Plan.⁵ End of the Leap Forward.TABLE 5.—*Generation of electric energy in Communist China*

[In billions of kilowatt-hours]

Year	Gross production ¹			Net production ²		
	Hydro	Thermal	Total	Hydro	Thermal	Total
1949	0.7	3.6	4.3	0.7	3.2	3.9
1952	1.3	6.0	7.3	1.3	5.5	6.8
1956	3.5	13.1	16.6	3.5	12.9	15.6
1957	4.7	14.6	19.3	4.7	13.5	18.2
1958	5.5	22.0	27.5	5.5	20.4	25.9
1959	7.8	33.7	41.5	7.8	31.0	38.8
1960 ³	9.0	38.0	47.0	9.0	35.0	44.0
1961	8.0	23.0	31.0	8.0	21.0	29.0
1962	6.0	24.0	30.0	6.0	22.0	28.0
1963	6.0	27.0	33.0	6.0	25.0	31.0
1964	7.0	29.0	36.0	7.0	27.0	34.0
1965	8.0	32.0	40.0	8.0	29.0	37.0

¹ Includes the energy used by power stations in the production of electric energy, as reported by the Communist Chinese 1949-59. (See source references 3, 8, 9, appendix.) Derived from net production 1960-65.² Net energy sent out from the generating stations. This is the way production is reported in the United States. Derived from gross production 1949 and 1952 by subtracting a reported 0.2 percent station use at hydroelectric stations, and reported station use of 12.7 and 7.05 percent at thermal electric stations. (See source reference 3, appendix.) For the years 1957-59 station use calculated at 0.2 percent for hydro and 7 percent for thermal. Figures for 1960-64 are estimates of the U.S. Federal Power Commission. (See source reference 7, appendix.) Total for 1965 is an increase of about 10 percent, as seems consistent with growth of industrial output. (See source reference 22, appendix.)³ Data from 1960 on have not been reported by the Communist Chinese, and are rounded.

2. Reconstruction and First Five-Year Plan, 1949-57

By the end of 1952, about 0.2 million kilowatts had been restored, and capacity reached 2 million kilowatts. Generation of electric energy in 1952 was 7.3 billion kilowatt-hours, and the annual utilization factor was about 42 percent.

During the period of the First Five-Year Plan, 1953-57, 2.5 million kilowatts of capacity were installed in power stations in Communist China at a cost of 3 billion yuan⁴ (about \$1.2 billion). Forty percent of this capacity represented restoration by the U.S.S.R. of units pre-

⁴ One yuan is worth about \$0.40 at an exchange rate of 2.5 yuan per dollar. This exchange rate is not official, but is a rate expressing the relative average purchasing power of the two moneys, and is used throughout this report.

viously removed from Manchuria. Twenty percent of the capacity additions were newly installed by the U.S.S.R., 20 percent by other East European countries largely Czechoslovakia and East Germany), and 20 percent by Communist Chinese. About 600 megawatts of the new capacity were in two large hydroelectric powerplants that had originally been built by the Japanese in Manchuria—Su-pung and Ta-feng-man. Hydroelectric capacity at the end of 1957 was thus brought up to 1 million kilowatts—22 percent of the total national installed capacity of 4.5 million kilowatts. Generation of electric energy in hydroelectric power stations in 1957 reached 4.7 billion kilowatt-hours—24 percent of total gross generation of 19.3 billion kilowatt-hours.

3. *The Leap Forward, 1958–60*

During the years 1958–59 the Communist Chinese embarked upon what they called a Leap Forward. The tempos of construction and production were both stepped up. In the 2 years, capacity of installed equipment in powerplants more than doubled—to 9.5 million kilowatts at the end of 1959. Gross generation likewise more than doubled, to 41.5 billion kilowatt-hours in 1959. However, the Leap Forward brought inefficient performance and strains on the economy and workers. By late 1960 the Leap Forward was in complete disarray, and the country entered upon a deep depression.

The momentum of the preceding 2 years carried installed generating capacity to 10.9 million kilowatts by the end of 1960. Of this amount, 2 million kilowatts were in hydroelectric power stations. Total investment in the 6.4 million kilowatts of new capacity installed during 1958–60 (and associated transmission lines) was close to 5 billion yuan (about \$2 billion). Generation of electric energy in 1960 was about 47 billion kilowatt-hour gross and 44 billion kilowatt-hour net, of which hydroelectric generation was close to 9 billion kilowatt-hour net.

In addition to this completed capacity, vast masses of manpower were marshaled during the Leap Forward for the construction of a large number of large, medium, and small-sized hydroelectric stations that were to have been completed in later years. Construction reportedly was started on over 30 large and medium-sized hydroelectric power stations and 20 small hydroelectric power stations, with a total planned capacity of close to 10 million kilowatts. This represented a start on a 10 billion yuan (\$4 billion) construction program.⁵ Perhaps one-third of this amount had been expended before the hydro construction program ground to a halt in 1960. Most of these projects remain abandoned; installation is progressing on only about 1 million kilowatts of this program.

During the Leap Forward the Communist Chinese electric power industry relied heavily upon aid from other Communist countries. The U.S.S.R. furnished a 150-megawatt (mw) hydrogenerator for the San-men hydroelectric power station in the Yellow River, several 100-megawatt turbogenerators for power stations in Manchuria and Peking, and numerous 50- and 25-megawatt units. Czechoslovakia and East Germany furnished 12-, 25-, and 50-megawatt turbogenera-

⁵ At the reported cost of 900 yuan per kilowatt for medium and large hydroelectric stations, and 1,400 yuan per kilowatt for small hydroelectric stations.

tors. But the new Communist Chinese generator industry, built with Soviet and Czechoslovakian aid, furnished about half of the new capacity installed, especially in the smaller unit sizes.

4. *Readjustment since 1960*

Since 1960, rates of introduction of new capacity and of generation of electric energy have fallen considerably. At the end of 1964, the total generating capacity had grown to about 12.9 million kilowatts, an increase of only 2 million kilowatts since 1960; one-half of this increase had taken place in 1961. Installation of new generating capacity in 1963 and 1964 probably did not exceed 200 megawatts a year. Total investment in the Communist Chinese electric power industry during the years 1961-64 probably did not exceed 2 billion yuan (\$800 million) and reached a low of about 200 million yuan (\$80 million) a year in 1964.

Installation of new generating equipment apparently increased in 1965. New generators were installed in several of the large hydroelectric powerplants started during the Leap Forward; total additions to hydroelectric capacity probably were close to 400 megawatts. With the general increase in industrial and construction activity in Communist China in 1965, it is probable that installation of new thermal electric capacity also increased, perhaps to about 200 megawatts. Total national generating capacity probably thus increased by about 600 megawatts in 1965, to about 13.5 million kilowatts, of which about 3 million kilowatts was in hydroelectric powerplants.

Gross generation of electric energy fell rapidly after 1960—as increasing numbers of industries cut back production and closed plants—and reached a low of about 30 billion kilowatt-hours (28 billion kilowatt-hours net) in 1962. Since 1962, gross generation has increased slightly, and reached close to 40 billion kilowatt-hours in 1965. Average utilization of generating equipment was about 3,000 hours in 1965, indicating a utilization factor of 34 percent. Net generation in hydroelectric power stations in 1965 was probably close to 8 billion kilowatt-hours and in thermal electric power stations about 29 billion kilowatt-hours.

The total net generation of electric power in Communist China of 37 billion kilowatt-hours in 1965 is roughly equal to the production in Alabama, Australia, or India in that year.

B. TRANSMISSION NETWORKS [1, 2]

Only about 60 percent of the generating capacity of power stations in Communist China is connected to public supply transmission systems. The remaining capacity is scattered in isolated industrial, municipal, and rural power stations.

The largest power network system in Communist China is the Northeastern system, supplying the major industrial centers of Manchuria. The basis for this system was established by the Japanese, and significantly expanded by the Communist Chinese, with Soviet aid, during 1955-60. The total capacity of the system is about 3,000 megawatts. (For comparison, the capacity of the Potomac Electric Power Co., serving Washington, D.C., is about 2,300 megawatts.)

The Eastern power system in Communist China is centered on Shanghai, and has a total capacity of about 1,700 megawatts. The

Hsinan hydroelectric powerplant, which furnished about one-fourth of this capacity, is one of the few successes of the Communist Chinese power station builders in the 1960-65 period. The Northern power system, with a total capacity of about 1,000 megawatts serves Peking and Tientsin. No other power system in Communist China has at present a capacity of more than 400 megawatts.

C. GENERAL TECHNOLOGICAL LEVEL [1, 2, 3]

Much of the present Communist Chinese electric power industry was constructed by technicians from the U.S.S.R., East Germany, or Czechoslovakia, on a base furnished by the Japanese. During the past two decades, however, the Communist Chinese have trained many native engineers and technicians, so that they now have a pool of trained manpower that can operate the industry without outside aid. Although the Communist Chinese have not developed major items of equipment or designed powerplants by themselves, they have in many cases shown an ability to complete powerplants started by the U.S.S.R. The many costly mistakes in the construction and operation of powerplants that took place in the 1950's are now generally a thing of the past.

Labor in the Communist Chinese electric power industry is plentiful, poorly trained, and poorly paid. In 1956 the industry employed 35 employees per megawatt of installed capacity. (The United States employed three employees per megawatt in the same year.) The average wage was about \$320 per year.

The capacity of standard generating units is usually 50 megawatts in large new thermal powerplants and 72.5 megawatts in large new hydroelectric powerplants. These powerplants are generally connected into a power systems by 110- or 220-kilovolt transmission lines. This general level of technology was reached by the United States in the 1920's.

The average heat rate (a good general index of technical efficiency) for thermal powerplants in Communist China in 1964 was 17,360 B.t.u. per kilowatt-hour. This level was about the same as that achieved in 1957; during the intervening years of the Leap Forward and its aftermath, technical efficiency in Communist Chinese thermal powerplants declined considerably. The United States achieved comparable heat rates in the late 1930's.

D. PRODUCTION OF ELECTRIC POWER EQUIPMENT [8, 17, 18]

Communist China possesses two large, modern complexes for production of electric power equipment—one in Manchuria and one in Shanghai. The Manchurian complex was originally built by the Japanese in the 1930's, but it was expanded considerably with aid from the U.S.S.R. during the years 1953-60. It consists of boiler, turbine, generator, and wire and cable plants at Harbin, and transformer, switchgear, and wire and cable plants at Mukden. The Shanghai complex, in the industrial suburb of Min-hang, was built with Czechoslovakian aid in the years 1952-55. It consists of boiler, turbine, generator, transformer, switchgear, and wire and cable plants. Each of these complexes has an integrated capacity to support annual installation of about 900 megawatts of generating capacity. Other smaller, older

plants in Shanghai proper, Peking, Chungking, and other places scattered throughout the country have a capability to support, in total the installation of about 400 megawatts a year of generating capacity in small unit sizes. Total national production of electric power equipment reached 2,150 megawatts in 1959, but had probably fallen to about 200 megawatts a year in 1964.

IV. CONSUMPTION OF ELECTRIC ENERGY [1, 2, 3]

Consumption of electric power in Communist China is very low for a country with such great population, area, and resources. This is a reflection of the generally low level of development in industry, transportation, and urban amenities. The average per capita consumption of electric power for all purposes was about 40 kilowatt-hours in 1964, compared to 54 kilowatt-hours in India.

The consumption of electric energy in Communist China, allocated by category of consumption, is shown in table 6, following.

The growth in consumption of electric energy in Communist China in the years 1949-59, and the decline since, is mainly a reflection of the growth and decline in industrial production. Industry and construction accounted for 82 percent of the final consumption of electric energy in 1952 and 90 percent in 1958. As industrial consumption has fallen more rapidly than other consumption since 1958, its share is probably close to 84 percent in 1965. The total consumption of electric energy per worker is about the level the United States reached before World War I.

Consumption of electric energy in agriculture is the only category of consumption that has shown consistent gains. Much of the increase is going to networks of irrigation and pumping stations being built for purposes of draining farmland in time of flood and irrigating it in time of drought. Otherwise, the countryside in Communist China is essentially unelectrified.

TABLE 6.—Consumption of electric energy in Communist China

[In millions of kilowatt-hours]

	1952 ¹	1956 ¹	1958 ²	1960 ³	1964 ⁴	1965 ⁵
Industry and construction	5,100	12,228	21,500	35,900	25,400	28,500
Agriculture	43	77	300	800	2,200	2,500
Transportation	100	131	200	300	300	300
Residential and commercial	987	1,544	1,800	2,600	2,600	2,600
Total end use	6,230	13,980	23,800	39,600	30,500	33,900
Transmission losses	885	1,470	2,200	3,900	3,000	3,300
Total available	7,115	15,450	26,000	43,500	33,500	37,200
Imports and/or exports ⁴	+285	-154	+400			
Net production	6,830	15,604	25,600	43,500	33,500	37,200
Power station use	431	989	1,900	3,500	2,500	2,800
Gross production	7,261	16,593	27,500	47,000	36,000	40,000

¹ See source reference 2, appendix.

² Total consumption by industry and construction, total end use, total availability and net and gross production are reported. (See source reference 19, appendix.) Consumption by agriculture and transportation have been estimated. (See source reference 2, appendix.) Residential and commercial is a residual.

³ Based on production, and successive withdrawals from production. Power station use is calculated to be 7 percent as in 1958; transmission losses, 9 percent; agriculture, transportation, and residential and commercial use as estimated by Wu for 1960 (see source reference 2, appendix); consumption by agriculture in 1964 was 22 times the consumption in 1957 (see source reference 20, appendix); industry and construction is a residual.

⁴ The extent of exports to imports from North Korea since 1958 is not known.

The electric energy used by the transportation sector includes both urban transportation (street railways and trolley busses) and use by railroads. There is no extensive railroad electrification in Communist China.

Consumption of electric energy by urban areas for residential and commercial use is low by any western standards. Annual consumption is about 20 kilowatt-hours per urban inhabitant. Most of the electricity is used for street lighting and lighting of public buildings. Home use is negligible or nonexistent in most areas.

V. RATES, REVENUES, COSTS, AND PROFITS [2, 3]

A. RATES

The rates charged for electric energy in Communist China are quite diverse, depending upon the category of consumer, the region, and the sales organization. The lowest rates are charged by the electric power industry for large light and power sales to industry, construction and transportation. The rates charged in the various power systems generally reflect the cost of producing electric energy in that power system. In 1958 large light and power rates varied from 3.3 fen⁶ a kilowatt-hour in the Northeast power system in Manchuria, to 9.2 fen a kilowatt-hour in the Northern power system, 9.8 fen a kilowatt-hour in the Eastern power system (Shanghai), and even higher in some smaller systems. A weighted national average of large light and power rates to industry for six different power systems in 1958 was 6 fen a kilowatt-hour. The rates charged by the electric power industry for wholesale sales to municipalities and communes average about 12 fen per kilowatt-hour.

The rates charged by municipalities and communes for electricity they sell at retail to households was generally set at a national rate of 29 fen a kilowatt-hour until the middle of 1962, when the rate was reportedly doubled, apparently as a means of rationing electricity to non-priority consumers following the collapse of the Leap Forward. With the gradual upturn of the economy since that time, some areas have announced reductions from these high price levels, but a general revision of electric power prices, as called for by some Chinese economists, thus far has not been observed. The difference between the purchase price from the electric power industry and the sales price to the final consumer represents costs of distribution, billing, taxes, and profit to the Government.

B. REVENUES

The gross value of revenues of the electric power industry in Communist China are reported to have grown from 430 million yuan in 1952 to 930 million yuan in 1956, and are calculated to have grown to 2.5 billion yuan in 1960 and then to have declined to 2.0 billion yuan in 1964, as shown in table 7, following. The revenues of the electric power industry have been predominantly derived from large light and power sales to industry, as is shown. In addition to the revenues of the electric power industry, the municipal and communal sales orga-

⁶ A fen is one-hundredth of a yuan, and is worth approximately 0.4 cents at effective exchange rates of 2.5 yuan to a U.S. dollar.

nization also derived revenue from the retail sales of electricity. If one is to compare the Communist Chinese and the United States pattern of revenues, these sales must also be included, as they are undertaken by the electric power industry in the United States. Total revenues from sales of electric energy from all organizations has grown from 0.6 billion yuan in 1952 to 1.2 billion yuan in 1956, close to 3.0 billion in 1960, and about the same in 1964. (At the standard exchange rate of 2.5 yuan to \$1, these revenues were \$0.24 billion in 1952, \$0.48 billion in 1956, and \$1.2 billion in 1960 and 1964.)

TABLE 7.—Gross revenues from the sales of electric energy in Communist China
[In millions of yuan]

	1952	1956	1960	1964
Electric power industry.....	1 430	1 930	2, 500	² 2, 000
Large light and power sales to industry, construction, transport) ³	310	740	2, 200	1, 700
Sales to municipal and communal organizations ⁴	120	190	300	300
Municipal and communal organizations ⁵	170	270	400	⁶ 500
Total (U.S. concept of the electric power industry).....	600	1, 200	² 3, 000	2, 500

¹ See source reference 3, appendix.

² Components do not add to total because of rounding.

³ Calculated at 6 fen per kilowatt-hour sold.

⁴ Calculated at 12 fen per kilowatt-hour sold.

⁵ Calculated at 17 fen per kilowatt-hour sold in 1952, 1956, 1960—the difference between the retail price of 29 fen and the wholesale price of 12 fen.

⁶ The retail markups of electric energy sales in 1965 are unknown. They are more than the 17 fen in 1960, but probably not as high as in 1962. A figure of 20 fen per kilowatt-hour sold is used here.

From 1952 through 1960 there was a steady decline in average revenue per kilowatt-hour sold, as a consequence of the shifting pattern of sales. As the share of industrial sales increased, and the share of more expensive municipal and communal sales dropped, the revenue per kilowatt-hour sold by the electric power industry fell from 6.9 fen in 1952 and 6.7 fen in 1956 to 6.4 fen in 1960. Including the revenues from retail sales, by municipal and communal organizations, unit revenues fell from 9.7 fen in 1952 to 7.7 fen in 1960. (These amounts are about 3.9 and 3.1 cents at the ratio of 2.5 fen to 1 cent.) Average revenues per kilowatt-hour increased in 1964, as a result of the decreased share of industrial sales in total sales, and as a result of the increase in rates for residential sales.

C. OPERATING EXPENDITURES.⁷

The out-of-pocket operating expenditures of the Communist Chinese electric power industry are reported to have grown from about 170 billion yuan in 1952 to 300 million yuan in 1956. Judgments of unit

⁷ Information is available only on the disposition of the revenues of the electric power industry in Communist China; information is not available on the disposition of the revenues of the various municipal and communal organizations that distribute electric energy to households and small light and power users. Within the industry, data have been published by the Communist Chinese concerning the disposition of revenues in 1952 and 1956 (see source reference 3, appendix), and an estimate has been made by Professor Wu at the Stanford Research Institute on the disposition of revenues in the Communist Chinese electric power industry in 1960. (See source reference 2, appendix.) Disposition of revenues in 1964 has been estimated on the basis of production and trends in components of expenditures. Although the figures given for 1964 are thus not based on Communist Chinese reporting, they are believed to reflect the general magnitude of expenditures and to illustrate some of the problems the Communist Chinese electric energy industry is facing.

cost trends, taken together with levels of generation of electric energy, indicate that operating expenditures grew to about 1,200 million yuan in 1960, and declined to about 900 million yuan in 1964. (See table 11, following.) Operating expenditures per kilowatt-hour sent out from the powerplant declined from 2.5 fen (1.0 cent) in 1952 to 2.1 fen (0.8 cent) in 1956. (See table 8, following.) Thereafter, however, the operating expenditures per kilowatt-hour sent out have increased, as a consequence of the disrupting effects of the Leap Forward, when generation was pushed regardless of the cost. At present, the low level of generation engenders high unit costs, as fixed charges loom large. Operating expenditures per kilowatt-hour sent out grew to about 2.8 fen (1.1 cents) in 1960 (largely as a consequence of much higher expenditures for fuels), and remained close to this level in 1964. Operating expenditures in 1964 required about 45 percent of the total electric operating revenues of the electric power industry, the same share as similar expenditures require in the United States.

TABLE 8.—Disposition of revenues in the electric power industry of Communist China

[In millions of yuan]

	1952	1956	1960	1964
Electric operating revenues ¹	430	930	2,500	2,000
Operating expenditures.....	170	320	1,200	900
Fuel.....	280	2150	2600	3400
Labor ⁴	50	90	300	300
Other costs ⁵	40	80	300	200
Depreciation and amortization ²	70	130	300	400
Taxes ⁷	20	50	100	100
Total operating revenue deductions.....	260	500	1,600	1,400
Net operating revenues.....	170	430	900	600
Returned to central Government.....	110	350	(⁸)	(⁹)
Retained.....	60	80	(⁹)	(⁹)

¹ From table 7, p. 313.

² See source reference 2, appendix.

³ Between estimates by Wu (see source reference 2, appendix) for 1957 and 1958, as was production at thermal power stations.

⁴ Labor force of 61,000 in 1952 and 114,000 in 1956 (see source reference 3, appendix) times an average wage of 800 yuan per employee. (See source reference 2, appendix.) Figures for 1960 assume 35 employees per megawatt of average installed capacity, as in 1956; figures for 1964 assume a decline to 30 employees per megawatt, and continuation of the same wage level.

⁵ Other operating costs in 1956 were 14 percent of costs of production (including depreciation) at hydroelectric stations, 20 percent of costs of production at thermal electric stations in 1956, and 18 percent overall. (See source reference 3, appendix.) The same ratio has been maintained for other years.

⁶ Increased from 1960 in proportion to increases in capacity.

⁷ At 5 percent of total revenues. (See source reference 21, appendix.)

⁸ See source reference 3, appendix.

⁹ Not available.

About one-half of the operating expenditures have been for fuel. Thermal electric power stations, burning coal almost exclusively, produce close to 80 percent of all the electric energy generated in Communist China.

Taxes represent a much smaller share of total deduction from revenues in Communist China than in the United States. Whereas taxes are equivalent to over 20 percent of electric operating revenue in the United States they are set by law at only 5 percent in Communist China. As the taxes and the profits go to the same organization—the

Central Government—in Communist China, the low tax rate is made up by a higher profit rate.

Largely as a result of the low tax rate, total operating revenue deductions for the Communist Chinese electric power industry have been a smaller share of total revenues than in the United States. Whereas they average about 80 percent in the United States they have ranged from 60 percent in 1952, to 54 percent in 1956, and about 70 percent in 1964 in Communist China.

D. PROFITS

Net operating revenues are all profit as far as the Communist Chinese are concerned, as they do not recognize a capital charge as an expense. In practice, however, part of the net operating revenues are returned to the Central Government, and part are retained in the electric power industry. That part which is returned to the Central Government is utilized to help defray the investments in the electric power industry by the Central Government. In 1952 through 1956, the funds returned to the Central Government out of net operating revenues amounted to about one-half of the investments by the Central Government in the industry. The funds retained by the industry during the same period were 14 percent of the electric operating revenues in 1952 and 8 percent in 1956. These retained funds were used to finance increases in working capital, unplanned capital repair, construction of workers housing, canteens, etc., and to provide bonuses for managers.

An approximation of the profitability of the Communist Chinese electric power industry, calculated according to U.S. accounting procedures can be obtained by deducting 20 percent (as in the United States) instead of 5 percent for taxes, and, in addition, 4 percent of the value of fixed assets as a capital charge.⁸ If this were done, the profits left to the Communist Chinese electric power industry would have been 1 percent of operating revenues in 1952, 14 percent in 1956, and 4 percent in 1960. In 1964, the industry would have operated at a loss of 10 percent.

It is probable that the Communist Chinese are aware of this relatively unfavorable position of the industry. Electric power probably moved from being a profitable industry to being an unprofitable one at about the time that residential electricity rates were boosted in mid-1962. Although the increased rates did not mean an additional return to the electric power industry—which sells at wholesale only—they did mean additional return to the municipal and communal organizations selling electricity to the final household consumer. Added profits to these organizations which then had to be returned to the Central Government would have offset the losses in the electric power industry, and would have done this specifically at the expense of the household consumer.

⁸ This is the percentage relationship between total utility plant and interest plus dividends, both common and preferred, in the U.S. electric utility industry in 1962.

APPENDIX

SOURCE REFERENCES

1. Berezina, Y. I., *Toplivno-energeticheskaya baza Kitayskoy Narodnoy Respubliki*, Moscow, 1959. Translated as JPRS 3784, *Fuel and Power Base of the Chinese People's Republic*, Aug. 31, 1960.
2. Wu, Yuan-li, *Economic Development and the Use of Energy Resources in Communist China*, New York, 1963. (Good for period through 1959. The Appendixes, in a separate volume, give much data on individual plants and areas.)
3. Industrial Statistical Department, State Statistical Bureau, *Wo-kou Kang-t'ieh, Tien-li, Mei-t'an, Chi-hsieh, Fang-shih, Tsao-chih Kung-yeh Ti Chin Hsi* (Past and Present of China's Iron and Steel, Electric Power, Coal, Machine Building, Textile, and Paper Industries), Peiping, 1958. Translated as *Major Aspects of the Chinese Economy through 1956*.
4. Bashenov, I. I., *Ugolnaya promyshlennost' Kitayskoy Respubliki* (The Coal Industry of the Republic of China), Moscow, 1959.
5. Crossfield Chemicals, *The Chinese Coal Industry*, Warrington, England, 1961. (A systematic mining of information in 4 above, with additional information.)
6. *Far Eastern Economic Review*, Apr. 16, 1964, pp. 159-160.
7. Federal Power Commission, *World Power Statistics*, Washington, D.C., annually. (Data are 2 years in arrears.)
8. State Statistical Bureau, *Ten Great Years*, Peking, 1960 (in English).
9. *Press Communiqué on the Growth of China's National Economy in 1959*, Peking, 1960.
10. Dmitriyevich, I. V., and K. Y. Pavlovich, *Gidroenergeticheskiye Resursy Kitayskoy Narodnoy Respubliki i Ikh Ispol'sovaniye*, Moscow, 1960, translated as JPRS 9838, *Hydroelectric Resources in the Chinese People's Republic and Their Utilization*, Aug 7, 1961.
11. *New York Times*, Feb. 7, 1964, p. 7.
12. Peking, *New China News Agency*, Sep. 25, 1963.
13. *Jen-min Hau-Pao*, Oct. 1, 1959.
14. *Pravda*, Feb. 21, 1962.
15. Peking, *New China News Agency*, Feb. 1, 1965.
16. JPRS (NY) L-343, *Survey of the Power Industry of China*, Sept. 28, 1958.
17. JPRS DC 6985, *Communist China's Electric Power Machinery Industry*, August 1962.
18. JPRS 3909, *Technical Achievements in Communist China's Electrical Equipment Industry*, Sept. 15, 1960.
19. Peking, *Shui-ti yu Tien-li*, May 20, 1959, p. 21.
20. *Survey of the China Mainland Press*, Jan. 5, 1964, p. 2.
21. JPRS 14,355, *Compendium of Laws and Regulations of the People's Republic of China*, July 2, 1962, p. 282.
22. Robert Michael Field, *Chinese Communist Industrial Production*, Oct. 21, 1966. A paper contributed to the Joint Economic Committee.

FISHERIES OF COMMUNIST CHINA

BY

LOYAL G. BOUCHARD

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FISHERIES OF COMMUNIST CHINA

POLICIES AND OUTLOOK

The post-World War II development of Communist Chinese fisheries has been characterized by two 5-year development plans (1953-57 and 1958-62). These plans, for the most part, have emphasized the development of inland and coastal fisheries, including extensive fish culture of fresh water and marine species, through collective effort. A "walking on two legs" policy was applied to fisheries development, and in fisheries terms meant the simultaneous development of the ocean fishing industry and the inland fishing industry, including emphasis on intensifying fishing effort and on the propagation of various species through fish culture.

Cooperative associations, people's communes, state-owned companies, and provincial government managed enterprises all contribute to fishery production. Cooperative associations and people's communes (people-operated fisheries), however, have contributed by far the greatest share of the catch, and have consistently outproduced state-operated fisheries enterprises. State-owned enterprises have only recently emerged as a dominant factor in the development of the distant-water phase of China's fishing operations; the high cost of developing high-seas fishing capability is undoubtedly the reason for this. The rate at which Communist China will develop its distant-water fisheries will depend upon the capital that can be diverted to the procurement of high-seas fishing and support vessels, trained manpower, and mechanized equipment. The future expansion of China's fisheries, however, would appear to be in the distant-water fisheries because the inland and coastal fisheries, including fresh-water and marine fish-culture aspects, are believed near maximum development and utilization.

ORGANIZATION AND ADMINISTRATION

As with other Communist countries, notably the Soviet Union, the state (Central Government) directs all fisheries policy and planning. The fishing industry of Communist China is under the Ministry of Fisheries which was officially established in 1956. At the provincial level, either a fisheries department or fisheries bureau has been established, depending upon the particular province involved. A fisheries department is administered by the provincial people's council as distinguished from a fisheries bureau which can be administered by either the Provincial People's Council or the Agriculture Bureau.

CATCH AND PRINCIPAL FISHERIES

China's catch comes mainly from (1) natural yield of inland and coastal waters, and (2) the extensive fish-cultural practices applied to those waters. The large network of inland rivers, streams, lakes,

ponds, and reservoirs and the extensive shallow coastal waters, combined with the climate, constitute ideal conditions for the breeding, propagation, and harvesting of fish. China has by far the largest yield from fish culture of any nation of the world.

The total catch, for the years 1950 and 1955-60 inclusive, was: ¹

Year:	Catch metric tons
1950	912, 000
1955	2, 518, 000
1956	2, 648, 000
1957	3, 120, 000
1958	4, 060, 000
1959	5, 020, 000
1960	5, 800, 000

In 1959, the catch yield ² from the various types of fisheries was:

Type of fishery	Catch	
	Quantity (metric tons)	Percent
Fresh water:		
Natural yield.....	1, 480, 000	29.5
Fish culture.....	810, 000	16.1
Total.....	2, 290, 000	45.6
Marine:		
Natural yield.....	1, 740, 000	34.7
Fish culture.....	990, 000	19.7
Total.....	2, 730, 000	54.4
Grand total.....	5, 020, 000	100.0

Of the total catch in 1959, about 90 percent was produced from people-operated fisheries, compared to 10 percent from state-owned enterprises. Also, 1,800,000 metric tons of fish were produced from fish culture, accounting for 35.8 percent of the total yield.

FLEET

China's fishing fleet ³ in 1959 consisted of (1) 131,000 sailing junks used on coastal marine waters, (2) 297,000 sampans used on inland waters, (3) 6,600 powered junks ranging from 5 to 20 gross tons, and (4) 6,300 junks of over 20 gross tons. The powered fishing fleet numbered 507 vessels and the breakdown was as follows: 414 inshore trawlers; 64 conventional trawlers (including four 110-foot vessels displacing 260 gross tons, with carrying capacity of 65 to 90 metric tons of fish, and with 19 to 23 men in the crew); 18 stern trawlers with 250- or 350-horsepower engines; eight seiners; and three whale catchers. Despite the powered fleet, 90 percent of the marine catch was estimated caught by small craft operated within a 20-mile strip of China's coastline. By 1959, over 3,000 of the larger sailing junks had been

¹ Source: *FAO Yearbook of Fishery Statistics*. Precise catch data for years beyond 1960 are unavailable.

² Source: "Development in the Fishing Industry in Communist China," by Ajia Kenkyu and Ajlya Keizai Junpo (1961) (translation).

³ Source: "China's Fishing Industry Is Developing Fast," article, *World Fishing*, vol. 10, p. 51 (December 1961).

fitted with 80-horsepower engines, and by 1964 more than 15,000 junks were expected to be so equipped. In 1959, most of China's powered fleet was based at Port Arthur (229), Tsingtao (117), Shanghai (70), and Hainan (47). In 1960, a few transport ships of 1,000 horsepower were reported launched for fleet work.

GEAR AND SPECIES

The principal forms of gear⁴ used in the marine fisheries and the species taken with this gear are:

Bottom trawls.—One- and two-boat trawling is conducted along the 15,000-kilometer (9,300-mile) coastline of Mainland China. The main species of fish caught with this gear are flounder, skate, yellow croaker, and cod.

Surrounding nets.—Purse seines, round nets, and wind nets are also used extensively in the coastal fisheries. Small and large nets are used in one- and two-boat fishing for mackerel, yellow croaker, herring, sardine, sea bream, and cod.

Gill nets.—Large and small gill nets are used extensively in the Chinese fisheries. The main species of fish caught by this gear are mackerel, sardine, Spanish mackerel, yellow croaker, shark, and flounder.

Hook and line gear.—Various forms of hook-and-line gear, including the handline, pole-and-line, and long line are also widely used. Main species taken are cutlassfish, snapper, sea bream, and tuna. In 1959, the long-line tuna fishery was the only high-seas fishery activity being conducted in Communist China.

Set nets.—Various types and sizes of set nets are also employed for various species. Usually such gear is staked in the shallow waters and is used for small species of fish and shrimp.

For fresh water fisheries, not much information is available on the types of gear used. However, much of the gear mentioned above is probably also used in the fresh water fisheries with the exception of bottom trawls, long lines, and the larger surrounding nets and gill nets. Various types of set nets, smaller gill nets, small round nets, cast nets, bamboo conical traps, and handlines probably predominate in the fresh water fishery. Main species taken are believed to be carp and related species and some shrimp.

The principal species propagated in marine waters is the sea tangle (*Laminaria sp.*). In the inland waters, the culture of bluefish (*Mylopharyngodon plicatus*), grassfish (*Etenopharyngodon ideus*), yellowfish, breadheadedfish, carp, and redfish is extensively carried out.

PROCESSING, MARKETING, AND FOREIGN TRADE

Dried and salted fish, canned fish, fish sausage, and frozen fish, as well as fresh fish, are produced and consumed by the Chinese people. The Government has provided several fish marketing centers and facilities, including freezing plants. The price of fishery products produced and sold internally is fixed by the Government.

⁴ Source: "Sea Fisheries in Communist China," by Shigeaki Shindo (1964) (translation).

In 1964, China imported 15,300 metric tons⁵ of fishery products from Japan, valued at US\$13.9 million. Imports included live fish; fresh, frozen, salted and dried, and canned fish; and such nonedible fishery products as agar-agar and sea shells.

Communist China in 1964 exported US\$37.7 million⁶ of edible fishery products to free world countries, surpassing even the Soviet Union (whose comparable exports amounted to US\$23.7 million). The 1964 export figure represented a large increase in value over 1963 when Communist China exported US\$21 million worth of edible fishery products to free world countries.

INTERNATIONAL COOPERATION

China belongs to the Western Pacific Fisheries Commission which includes the U.S.S.R., North Korea, North Vietnam, and the Mongolian Republic. The principal purpose of the commission is to conduct coordinated fisheries research and oceanography in the seas and the western Pacific adjacent to the coasts of the majority of those countries, and to cooperate in the conservation and utilization of the fishery resources. It is believed that the commission meets annually in one of the capitals of the signatory nations. The 1964 meeting was held in Hanoi, North Vietnam, but little is known of the workings of this meeting or of any of the previous or subsequent meetings that might have been held.

ACKNOWLEDGMENT

Acknowledgment is given to Milan Kravanja, foreign fisheries specialist, Branch of Foreign Fisheries, U.S. Bureau of Commercial Fisheries, who provided information on China's fishery trade and association with the Western Pacific Fisheries Commission.

⁵ Source: *Fishery Products Trade Statistics, 1964*, Fisheries Agency, Japanese Government.

⁶ Source: U.S. Department of Commerce.

MONEY AND BANKING IN COMMUNIST CHINA

BY
S. C. TSIANG

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MONEY AND BANKING IN COMMUNIST CHINA

I. THE TRANSITIONAL STABILIZATION PERIOD 1949-51

In the evolution of monetary management in Communist China, the years before 1951 clearly constitute a separate period. During the first 2 years of the Communist regime, the Government still had not extended its firm control over all the industries and banks and the technique of economic planning and regulation had not yet been mastered from the experience of advanced Socialist countries. The violent inflation which it had inherited must be fought with what seemed to be essentially native weapons developed on the basis of native thinking.

The Nationalist regime in its final years of power on the mainland of China completely lost its control over the fiscal and monetary situation of the country. With the loss of an increasing portion of the countryside to the insurgents, the main source of revenue, the agricultural tax, was progressively lost, while the ever expanding scale of civil war demanded more and more expenditure. In face of the overriding necessity to finance the war without adequate sources of revenue, monetary policy of course was powerless to do anything. However, even well before the military situation became hopelessly adverse to the Nationalists, their fight against inflation was doomed to failure, because the monetary policy followed by the banking authorities was so tragically mistaken. The dominant view of the monetary authorities then in power was that the rate of interest is an important element of costs of production. Since prices are determined by costs, to fight the already rampant inflation, it was argued, the rates of interest must be kept low. This well entrenched view on the part of the authorities was not very rigorously refuted by the academic economists either. Many of the latter, with a half-baked understanding of the "new economics" of that time, also tended to regard prices as cost-determined and the rate of interest as having no significant effect on saving and spending. The natural result of such a monetary policy, that pegged the interest rates charged by banks at a low level in face of rampant inflation, was that the banking system was totally unable to absorb any voluntary savings that might still have been generated by the emaciated economy. The banks, whose lending and deposit rates were controlled by the authorities, could not attract any funds for their lending operations, but must go periodically to the Central Bank to get their allotted quota of funds, which the latter, as the only bank of issue, generated out of the printing press. This process of making credit with the printing press had been aptly called the "deficit-financed credit system".

This absurd situation had prompted the author, then teaching at the National University of Peking, to put forward a proposal for a kind of price-index-escalated savings certificates, the capital value as

well as interest payments of which in terms of money are to be increased in proportion to the wholesale price index, so that the effective real interest rate on such savings certificates would never become negative even during rapid inflation.¹ This was for the purpose of diverting genuine savings of the population away from the hoarding of commodities and other unproductive physical investments, channeling them into the banking system, and thus helping to put an end to the "deficit financed credit system". Although it generated some discussion among academic economists, this proposal met with no response at all from the monetary authorities of the Nationalist Government.

What great surprise it was to me to learn, when I was already a refugee in this country, that this neglected proposal should become an important part of the Communist monetary reform during the early transitional period soon after their takeover. It was hardly to be expected that the Communists, whose avowed aim was the destruction of capitalism, should adopt a proposal that was to insure a positive real rate of interest to money capital in time of inflation.

The Communists extended their control over the country during 1949. With the extension of their military and political control the Jen-Min-Pi replaced the gold yuan notes as the currency. The inflation, however, was not stopped by the mere change of the currency. The new government continued to run large deficits which were financed to a large extent by increases in currency issue. Since the tax machinery as well as industries and commerce were not yet under their effective control, the Communist regime was obviously incapable of eliminating budget deficits all at once. Thus, their monetary authorities were also confronted with the problem of coping with an inflationary situation with monetary and credit policy. In this early stage, they were apparently openminded enough to be able to profit from criticism that was directed against their predecessors. During the second half of 1949, while they were still extending their military control in the south and southwest China, the Communist regime instituted at different times in all government banks in the areas they conquered a scheme of so-called "real goods savings deposits" (Che-Shih Chu-Hsü Tsuen-Kuan). These deposits were reckoned in terms of a "real goods unit," which consisted of a bundle of staple consumption goods that were daily necessities to most people, *viz*, rice, flour, white cotton cloth, and coal. The money value of each real unit was to be determined every 10 days according to the wholesale prices of these commodities. Withdrawals of deposits and interest payments would both be made in Jen-Min-Pi according to the current money value of the real units involved.

Since detailed money and banking statistics in Communist China are notoriously unavailable, it is hard to judge precisely to what extent this measure had succeeded in attracting and stimulating savings, and how much it had contributed to the stabilization of prices. One gets only some scrappy information from occasional articles such as the one by Wang Wei Tsai, entitled "Further Development of the

¹The proposal was put forward in two articles published in *Ching-Chi Ping-Ruen (Economic Review)*, Shanghai, Apr. 6 and May 19, 1947.

People's Savings Deposit Business."² According to Wang, the new deposit scheme met with enthusiastic response from the population. In Shanghai alone, within the first month and half after the institution of the real unit savings deposit scheme, 330,000 new accounts were opened. The total balance of savings deposits increased from 10.07 million new JMP yuans at the end of 1949 to 131.70 million at the end of 1950 and 543.37 at the end of 1951.³ Although the increase in aggregate balance of savings deposits during 1950 (*i.e.*, 121.63 million new JMP yuans) was hardly 1 percent of the total money purchasing power of the private sector (private disposable income) or 2 percent of the total budget revenue of that year, it was roughly equal to 42 percent of the budget deficit of that year.⁴

Not stopping at the institution of real unit savings deposits at all Government banks, the Communist government further announced in December 1949 the issue of the "People's Victory Real Unit Bonds," which, like the savings deposits, were denominated in real units consisting of a bundle of 3 kilograms of rice, 0.75 kilograms of wheat flour, 1½ meters of white cotton muslin and 8 kilograms of coal. The rate of conversion between this bundle or real unit and the JMP was to be determined every 10 days on the basis of the weighted average of the combined wholesale prices of these commodities in Shanghai, Tientsin, Hankow, Sian, Kwanchow, and Chungking. The interest rate on these bonds was to be 5 percent. The payment of interest as well as the repayment of capital were to be made in JMP according to the latest conversion rate of the real unit. These bonds were to be repaid over a period of 5 years ending 1956. A total of 200 million real units of such bonds were to be issued, but in the first stage starting January 1, 1950, only 100 million real units were to be issued.

In announcing the issue of real units bonds, the Communist Chairman of Economic Commission Chen Yün acknowledged that the rapid rise of prices during 1949 was due to the deficit spending of the Government financed by note issue, but he declared that under the current circumstances issuing bonds would be preferable to raising taxes. The sale of bonds was, however, very unlikely to have been left to voluntary subscription; for the Communist government explicitly aimed its sales campaign at private industries, wealthy people, and retired former officials, that had so far escaped liquidation. The methods of persuasion employed could very well amount to coercion. Thus such bond sales really take on the nature of a capital levy. The surprising feature was that the state should have undertaken to guarantee the real purchasing power of the bonds and a positive real rate of interest on them.

Whether by persuasion or coercion, the sale of real unit bonds was carried out with great vigor and the first hundred million real units were quickly oversubscribed. The payments for bond subscriptions brought about such as sharp contraction in currency in circulation

² "Chin-I-P'u Fa-Ch'an Jen-Min Chu-Shü Shih-Yeh," an essay collected in *Fa-Hsing Hsin-Te Jen-Min-Pi Te I-Yi Yü Tso-Yung* (The Significance and Functions of the Issue of New Jen-Min-Pi), Public Finance and Economics Publishing Co., Peking, 1955.

³ The new Jen-Ming-Pi was issued in March 1955 to replace the old Jen-Ming-Pi in circulation since 1949 at the conversion rate of 10,000 old yuans to 1 new yuan.

⁴ The figures for the purchasing power and national budget deficit of 1950 were the estimates given by Dwight Perkins in his *Market Control and Planning in Communist China*, Cambridge, Mass., 1966, tables 28 and 33, pp. 242 and 255.

during the first few months of 1950 that the rapidly rising price level was already brought to a halt by March 1950. From March 1950 onward the official wholesale price index even showed a substantial decline. The new official wholesale price index was 100 for March 1950. For April it was down to 75.1; and for December 1950 it was 85.4.⁵ The very precipitous drop in prices from March to April was obviously the result of desperate efforts on the part of private individuals and enterprises to raise cash to pay for their forced subscriptions of bonds. The swift stabilization of prices achieved during the first few months of 1950 gave the Communists the breathing space needed to revamp the tax machinery to cope with the demand for expenditure, so that for the whole year 1950, the Government found it necessary to issue only 140 million real units of bonds with total proceeds of 483.3 million new JMP yuans.⁶

While the sale of bonds was obviously coercive, the encouragement of savings deposits, however, appeared to have relied largely on incentives and milder form of persuasion. This may be gaged from the following innovations introduced into the savings deposits scheme during 1950. After the sharp drop in wholesale prices from March to April 1950, the possibility of a general price decline once more became a realistic prospect in China. The fact that the money values of savings deposits would vary in proportion to wholesale prices would become a deterrent to savings, if further price declines were expected. To counteract the expectation of a possible price decline, the monetary authorities introduced in May 1950 a new scheme of savings deposits called "double guarantee savings deposits" (Shuan-Bao Chu-Shü) or "guaranteed capital, guaranteed purchasing power savings deposits" (Bao-Beng Bao-Chi Chu-Shü). Such deposits would increase in money value if the composite price of the real unit should go up, but would retain their original cash value if the composite price of the real unit should go down. It was virtually a "heads you win, tails I lose" arrangement for the depositors.

This kind of solicitous concession to depositors indicated the great importance which the Communist authorities placed on the attraction of savings of the people into banks. This attitude may seem puzzling to some economists trained in modern economic theory. For modern monetary theory tends to emphasize the liquidity of savings deposits and their similarity with money. Savings deposits are often regarded as quasi-money. It is, therefore, often argued that the expansion of savings deposits should also be restricted, if inflation is to be checked. It would seem strange then that the Chinese Communists should be so anxious to bring about an increase in quasi-money as an anti-inflationary measure.

This line of thinking seems to me to spring from an overexaggeration of the function of money as a store of value. Indeed, it tends to regard the demand for money as largely derived from the store-of-

⁵ From Chang Wen, "The Stability of the Purchasing Power of JMP Looked at From the Stability of Prices During the Past 5 Years," in *Fa-Hsing Hsin-Te Jen-Min-Pi Te I-Yi Yü Tso-Yung* ("The Significance and Functions of the Issue of New People's Currency"), Public Finance and Economics Press, Peking, 1955.

⁶ Based on the article by Jung Tse-Ho, "Summary of the 1950 Financial Work and Policy and Tasks for 1951," that appeared in *Jen-Min Jih-Pao*, Mar. 28, 1951. The figure for the total proceeds of bond sales in 1950; i.e., 483 million yuans given here is considerably larger than the figure for "receipts from domestic bonds" estimated by George N. Ecklund, in "Financing the Government Budget in Communist China."

value function of money. Thus, if there is an increase in the supply of any close substitute to money as a store of value; *e.g.*, savings deposits, the demand for money to hold would decline, and money would be released out of hoards and fed into the active circulation.

This line of reasoning seems to me quite inapplicable to the case of China during this transitional period. After many years of rampant inflation, money had long ceased to be considered as a good store of value. People had developed a protective habit of turning money into goods as soon as feasible. The offering of the scheme of real unit saving deposits by government banks means the appearance of a fairly liquid and productive store of value in competition not with money, which is already out of the running as store of value, but with the hoarding of commodities, purchase of durable consumers' goods, or sheer spending sprees. Furthermore, the increase in the flow of currency from the hands of the public into savings deposits enables the banking authorities to finance more essential investment which they would otherwise be obliged to finance with new currency issue. Thus, the increase in savings deposits represents on the one hand a more or less corresponding decrease in private spending and on the other a corresponding decrease in the rate of increase of money supply. This is one of the many instances where one finds it necessary to adjust the monetary theory developed in advanced Western countries to explain the monetary phenomena in countries of totally different backgrounds.

It is interesting to observe what happened to the money rate of interest during this period of inflation and stabilization, while real rates of interest on savings deposits and bonds were either pegged or prevented from falling below a fixed level. Of course, in Communist China there was nothing approaching a free money market. The rates of interest charged by all banks were under the control of the People's Bank. According to a 1951 article by Yang Pei-Hsin, a well-known Communist economist, the money rate of interest for lending authorized by the People's Bank stood at 65.5 percent per month in December 1949, 39.0 percent per month in January, 27.0 percent per month in March, 3.9 percent per month in June 1950, 2.4 percent per month in February, and 2.0 percent per month in June 1951.⁷ From these figures, it is obvious that the Communist monetary authorities certainly did not fall into the same mistake as the Nationalists did in holding the money rate of interest down at ridiculously low levels in face of a galloping inflation in the vain hope of holding down thereby the cost of production. As we have seen above, the rise in wholesale prices was checked in March 1950 and in April they had even declined considerably. Yet the money rate of interest remained at 27 percent per month in March 1950 and was lowered to only 3.9 percent per month in June that year when prices had been fairly stable for already 3 months. By June 1951 the money rate was brought down to 2 percent per month, which is still fairly high even by the prewar Chinese standard. Thus it is clear that the money rate of interest was certainly not artificially forced down regardless of the demand and supply for loanable funds but was eased down very gently

⁷ "Kuan-Yü Wo-kuo te Li-lü Wen-ti" ("On the Interest Rate Problems of our Country"), *Jen-Min Jih-pao*, July 1951.

as the expectation of continuous price rise tapered off and very probably no faster than a free money market would have done.

It should be of great interest to us to see how the Communists themselves justify such extraordinarily high interest rates. Yang's article, which, being published in the *Ten-Min Jih-pao*, must have reflected the official position at that time, put it in the following way:

The accumulated funds of New China are not the loan capital of old, but consist of appropriations out of the national budget, temporarily unutilized funds of our Socialist enterprises, and savings of the people. State banks are not the intermediaries for loan capital but one of the mechanisms for the allocation of the nation's funds. The functions of the interest rate lie in inducing enterprises to deposit into banks their temporarily unutilized funds as quickly as feasible and in urging them to use their funds economically and only on the development of operations or the reduction of costs. With respect to savings of the people, the interest rate is also a material encouragement. Since banks are now rid of the control by the capitalist class, the rate of interest is no longer a part of exploitative profit.

From this passage, in spite of its Communist dialectics and jargon, one can still see that the parametric functions of the rate of interest was understood more or less in the same way as in Western classical economics, *viz*, to serve as an inducement for savings and a criterion for the allocation of scarce investible funds.

Thus on the whole, it seems that during the transitional stabilization period Communist China's monetary policy was still influenced to a considerable extent by Chinese economists trained in Western economic theory. In particular, the Communists were able to profit from the criticism directed by academic economists against the monetary policy of the Nationalist Government before its downfall on the mainland and thus were able to avoid the latter's mistakes.

II. THE PERIOD OF COMPREHENSIVE FINANCIAL PLANNING

The year 1951, however, marked a turning point in the monetary management of the Communist regime. All through the transitional period, the Chinese Communists were busy learning from Soviet Russia all the methods of economic planning and controls which the latter had evolved from her experience. The main instrument of fiscal and monetary planning which they were to learn and adopt from the Soviet Russia was the so-called comprehensive financial planning. This is an all-inclusive plan, to be prepared every year by the central planning authorities, of sources and uses of funds for the whole economy. It is to be constructed from a number of subplans; *viz*, the national budget, the extra-budget revenues and expenditures plan of the Government, financial plans of individual enterprises, credit plan of the banking system, cash inflows and outflows plan of the People's Bank, cooperatives' or communes' financial plans, and finally, the estimate of the balance of money incomes and expenditures of the population.

Although basic planning of the allocation and utilization of resources in Communist countries is generally made in real terms, a parallel plan in monetary terms is usually drawn up simultaneously so that the flows of money and credit would correspond as closely as

possible to the planned allocation of real goods and services, and so that physical output goals may be stipulated in stable monetary terms. The comprehensive plan is indeed the counterpart of the physical plan for the nation's economy, and is roughly equivalent to a national resources budget in money terms.

From 1951 the Communist regime was working toward the adoption of the method of comprehensive financial planning together with the first 5-year physical plan. One of the preparatory steps was the separation of the cash circulation circuit and the noncash settlement circuit.

Already in April 1950, the Communist central authorities had ordered government offices of all levels, state enterprises, and cooperatives to deposit all their cash (currency) holdings with the People's Bank. In July it was further decreed that all cash receipts by government organizations and state enterprises must be turned in at the People's Bank on the same day as they were received and generally no more than 3 days currency requirements are to be retained as petty cash holdings by these organizations and enterprises. In January 1951, to complete the so-called cash control, the Communist government further decreed that all transactions between socialized enterprises must not use cash as means of payments, but must be settled through transfers on the books of the People's Bank. Furthermore, each transaction must be settled individually through the People's Bank, and there must be no mutually granting or receiving of credit or deferred payment arrangements between enterprises or trading units.

Thus, cash (or currency) is circulated only in connection with purchases by the government and state enterprises from the private sector, transactions within the private sector, purchases by the private sector from the public sector and payments of taxes. The increasing volume of transactions within the public or socialized sector itself, *i.e.*, between state enterprises and government units or between state enterprises themselves are to be conducted entirely through transfers on the books of the People's Bank.

The rationale of the restriction on cash circulation is often given as the economization of the use of currency and the reduction of the need for currency issue.⁸ This kind of rationalization of course hardly make any sense, for the direct social cost of making payments item by item through transfers on the books of the People's Bank may be considerably higher than the cost of printing enough currency for all transactions to be effected with the use of cash. The real purpose for the restriction on cash circulation and the establishment of the noncash circuit is probably to facilitate the supervision of the expenditure of all state enterprises and government units by the State Banks. Indeed, the People's Bank and other special purpose banks are specifically entrusted with the function of supervising the operations of state enterprises and their executions of the economic plans set for them. Since each single transaction of a state enterprise must be effected either by a transfer between the accounts carried at the State Bank or by a withdrawal of cash authorized specifically for that purpose, the bank would be placed in an excellent position to detect and

⁸ See for instance, Chi Ts'ai Ch'eng, *Tsung-ho Ts'ai-cheng Chi-hua Chien-ruen* (Concise Treatise on Comprehensive Financial Planning), Public Finance and Economics Publishing Co., Peking, 1961, esp. p. 29.

check any unauthorized transactions, such as the hoarding of raw materials in anticipation of their impending shortage, which tends to precipitate and aggravate their shortage and thwart their rational allocation. At the same time, the restriction of the use of cash by government units and state enterprises more or less to payments to private consumers only makes the control of net cash outflow from (or inflow into) the People's Bank a more effective means of controlling the balance between demand and supply of consumers' goods in conjunction with the physical plan for the supply of consumers' goods.

Of the component plans of the comprehensive financial planning, by far the most important one is the government budget. According to Chi, writing in 1961, approximately 80 percent of the available financial resources allocated through the comprehensive financial plan are collected and distributed through the national budget.⁹ However, since our purpose is not to discuss the fiscal policy of Communist China but to study its monetary and banking policy, we shall only examine two of the component plans that are most relevant to our purpose, *viz.*, the Credit Plan and the Cash Plan.

The Credit Plan determines the amount of short- and medium-term credit to be made available to state enterprises and agricultural communes or cooperatives by the People's Bank, which by June 1952 had merged all private banks. This plan is prepared in the form of a sources-and-uses-of-funds balance statement. From the verbal description by Chi¹⁰ we may reconstitute the annual aggregate credit plan in the form of the following table.

Aggregate Credit Plan

SOURCES OF FUNDS	USES OF FUNDS
Increase in government deposits (belonging to government units of all levels, including transfers of funds in process).	Increase in loans to industries.
Increase in deposit balances of enterprises.	Increase in loans to socialized commercial organizations.
Increase in savings deposits.	Increase in loans to agricultural communes and cooperatives.
Increase in deposit balances of communes.	
Appropriation from national budget for credit purpose.	
Bank's operating profit.	
Increase of currency in circulation.	

Such a balance statement looks like a simple balance sheet of a bank put in incremental terms. The two sides should always balance. It therefore, calls for some explanation how such a statement can be treated as an equilibrium condition or an aid for credit planning to achieve equilibrium. Indeed, in modern monetary theory, current deposits are generally regarded as part of the money supply and it is generally recognized that they can be created by the banking system itself in its lending operations. It is rather surprising that the Communist monetary authorities should consider an increase in such

⁹ Chi, *op. cit.*, p. 18.

¹⁰ Chi Ts'ai Ch'eng, *op. cit.*, pp. 25-28.

deposits noninflationary sources of funds for credit granting. Such a view is not peculiar to the Chinese Communists alone, but, as has been pointed out by George Garvy,¹¹ is shared by the Russians, from whom the Chinese Communists have learned the technique of comprehensive financial planning, as well as by the monetary authorities of other Communist satellite countries.

The explanation given by Chi, in his apparently official-sponsored treatise, is that deposit balances of government and enterprises represent funds temporarily unutilized (Hsien-hsieh Tse-chin). There seems to be a naive belief that to these temporarily unutilized funds there correspond physical goods of equal values temporarily lying idle somewhere in the economy. The following quotation from Chi should make this clear:

The overwhelmingly large part of the financial revenue of our state comes from the earnings surrendered by the state enterprises. Before they are allocated to different uses, these revenues are deposited in the physical form among the socialized enterprises and at the same time in money form in the account at the People's Bank. Through credit operations they (these unutilized financial revenues and their physical counterparts) can be redistributed.¹²

The theoretical flaw of this argument is obvious enough. There is simply no such straightforward correspondence between the deposit balances and available unutilized physical resources; the possibility that total deposit can be expanded by the bank's own lending is apparently overlooked. Furthermore, there seems to be also a naive belief that since bank loans are used only to finance working capital and inventories and are thus secured by physical goods and generally repayable within a short period (the longest period being a year), such secured self-liquidating credit cannot be inflationary. This is indeed similar to the "real bills" doctrine that was once held widely in the United States but now generally discarded as invalid.

What with the treatment of all deposit balances as noninflationary sources of funds for granting credit and a rather naive belief in the soundness of secured, self-liquidating credit, the Credit Plan is no more than a mere counterpart of the material plans for investment in working capital and inventories, which bank credits are meant to finance. If the material plans have already authorized certain project for building up working capital or inventory in certain enterprises, it is unlikely that these investments would be denied financing at banks. Thus the Credit Plan is in reality little more than a set of projections based on the material plans and capable of providing only some guidance for credit operations of the banking system. When the physical plans are overambitious or miscalculated on the basis of exaggerated statistics of the availability of physical goods, the Credit Plan would also tend to be overambitious. Thus during the so-called Great Leap Forward period of 1958-60, the banking authorities simply had to expand credit to keep pace with overambitious self-deluding physical plans. The supply of funds did not seem to have imposed an effective and nonflexible restraint on the credit operations

¹¹ George Garvy, *Money, Banking and Credit in Eastern Europe*, Federal Reserve Bank of New York, 1966, pp. 55-58.

¹² Chi, *op. cit.*, p. 28.

of the banks at all; for in 1958 alone total deposits in the People's Bank increased by an amount equal to the increase during the whole First Five-Year Plan and in 1959 these deposits rose by another 39 percent over 1958.¹³ This demonstrated the fact that bank deposits after all can be created, even though Communist monetary authorities do not recognize it.

However, we must not be too hasty to judge the Communist credit policy on the basis of modern Western monetary theory. In this case, important differences in institutions must be taken into account. First of all, it is perhaps not right to regard all current deposit balances of government units and state enterprises in the State Bank as money. These deposits are certainly not the perfectly liquid assets that can be spent or invested at will, as current deposits in a free society are. Theoretically at least, such deposits can only be spent for authorized purposes in conformity with the budget or economic plan. In the case of purchases of goods, disbursements out of these balances normally can only be effected at the initiative of the creditor, by his submitting to the bank a draft on the debtor accompanied with documentary proof of shipment. The State Bank is supposed to have the responsibility to check whether the shipment and the prices charged are in conformity with the economic plan before it carries out the transfer on the book between the two accounts. As to investment of these current deposits on other financial assets, either for liquidity consideration or for yield, it is simply out of the question. Thus it seems to me quite wrong to treat the deposits of the government and state enterprises as money. In this connection, we should remember that it is generally regarded as not proper to treat government deposits even in a free capitalistic society as part of the money supply; for even in a capitalistic country, the holding of deposit balances by the government is normally not determined by any careful consideration of liquidity or the requirement for transactions and precautionary purposes; nor, conversely, are government expenditures determined in any sense by the amount of existing government balances. How much more removed from the concept of money as the perfectly liquid asset and freely disposable means of payments government balances in Communist countries would be.

As to their seemingly naive belief in the "real bill doctrine," again the usual reasons, for which this doctrine is now recognized as invalid in a capitalist system, may not be applicable to a Socialist command economy. The real bill doctrine does not work in a capitalist economy mainly for two reasons. First, an increase in credit to finance an investment in working capital may not necessarily lead to a corresponding net increase in aggregate real working capital of the economy; for the increase in credit may bid up prices and bid away resources from elsewhere. Second, the net increase in output resulting from the net increase in working capital may be no match for the increase in aggregate demand generated by the increase in investment and money supply, for the investment multiplier, or the velocity of circulation of money, whichever is relevant to the economy concerned, could easily be larger than the gross productivity of the working capital that

¹³ See Dwight Perkins, *Market Control and Planning in Communist China*, Cambridge, Mass., 1966, p. 125.

actually get created. Both these reasons, however, probably do not apply to a Socialist command economy provided it is properly planned. There, as the grant of credit is presumably based upon the planned availability of materials and labor for the investment in working capital at controlled prices, the first reason obviously does not apply. Furthermore, the velocity of circulation of bank balances of enterprises in a Communist country is strictly under control, so that an increase in credit would not necessarily cause aggregate demand to outstrip supply.

In fact so long as the material economic plans are consistent and realistic, an expansion of credit to finance the authorized investments in working capital and inventories is quite unlikely to generate much inflation. So long as the disbursement of the deposit balances is conditioned upon the availability of physical goods at controlled official prices as planned (which is presumably insured by making the transfer of deposits on the books of the State Bank dependent upon the presentation of the document of shipment), there is little fear that the increased deposit balances in the People's Bank would circulate uncontrollably round and round driving up prices wherever they go. This is the true rationale for the creation of the noncash settlement circuit. As far as goods and services bought are sold in the noncash circuit are concerned, there seems to be little danger of inflationary price movements, as these goods are in effect allocated according to material plans.¹⁴ This point is clearly recognized by a Chinese Communist economist Lin Chi-Ken in this article, "How the Law of Money Circulation Operates Under the Socialist System," published in 1963.¹⁵

The only liquid assets in a Communist economy that are at all likely to circulate round and round, bidding up prices where they are not pegged and creating excess demands and long waiting lines where they are, is currency. That is the basic reason why great emphasis is placed on controlling the quantity of currency in circulation. As Garvey puts it, "prompt recapturing of largest possible amount of currency put into circulation is one of the shibboleths of monetary management in all Communist countries."¹⁶ Therefore, the item that is watched most closely in the credit plan is the "increase in currency circulation," which is planned in conjunction with the Cash Plan of the People's Bank.

The Cash Plan is probably the chief operating document of the People's Bank in its effort to maintain monetary balance. It is a plan for the cash circuit, with the People's Bank as the starting point as well as the finishing point of the circuit, for the bank is not only the sole issuer of currencies but also the legally stipulated recipients of cash receipts of government units at all levels and of cash proceeds of all government enterprises and communes. As given in Chi Ts'ai Ch'eng's officially sponsored book, the aggregate cash plan of the People's Bank looks like the following.¹⁷

¹⁴ This conclusion of course must be qualified, if the material plans are based upon falsified statistics and thus inconsistent.

¹⁵ *Ching-Chi Yen-Chiu*, No. 2, Feb. 17, 1963.

¹⁶ *Chi, op. cit.*, p. 29.

¹⁷ *Chi, op. cit.*, p. 29.

Cash Plan of the People's Bank

CASH INFLOWS	CASH OUTFLOWS
Retail sales receipts.	Payments of wages by the state.
Public utilities and services receipts.	Payments of wages by communes and handicraft industries.
Taxes and other fiscal receipts in currency.	Other payments by the state to individuals.
Savings deposits receipts.	Government purchases of agricultural subsidiary products.
Deposit receipts of communes.	Government purchases of manufactured products.
Repayments of agricultural loans.	Administrative expenses of government units (all levels).
Cash transferred from the Trust Department.	Management expenses of state enterprises.
Cash received from remittances.	Withdrawals of savings deposits.
Receipts from bond sales.	Withdrawals of communes' deposits.
Other receipts.	New agricultural loans granted.
	Cash transfers to Trust Department.
	Cash disbursements for remittances.
	Others.
Total:	Total:
(Net injection of currency into circulation.)	(Net withdrawal of currency from circulation.)

The balancing item of either a net injection or a net withdrawal of currency in the aggregate cash plan must of course be identical with the net increase (or net decrease if negative) of currency in circulation in the aggregate credit plan shown above. According to Chi, among the items of receipts in the cash plan, the most important are the retail sales of commodities, receipts of utilities and services industries, and receipts of savings deposits of the population. These three items together account for as much as 85 percent of the total inflow of currency, and are therefore regarded as the main channels for the withdrawal of currency from circulation.¹⁸ At the beginning of each year, these items are to be estimated on the basis of the projected purchasing power of the population and their spending habits. Theoretically the supply of consumption goods to be released to the population is to be matched with the estimated expenditures of the population on these goods. This is, however, the task for the overall planning authorities who have the final responsibility of coordinating the credit and cash plans with the physical plans of production. For the part of the People's Bank, the net injection of currency into circulation in excess of the increase in cash requirement for transactions in the cash circuit, estimated on the basis of a sort of quantity theory equation, is watched as the chief signal of troubles.

As is obvious from a glance at the cash plan, any disequilibrium in the cash circuit (reflected in a potential excessive net outflow of cash into circulation) can be corrected on the side of cash inflows by an increase in retail sales receipts, or public utilities and services receipts, through an upward adjustment of prices, or a raise in taxes, or

¹⁸ Chi, *op. cit.*, p. 30. Chi's book was first published in October 1961. It is to be noted that taxes and other fiscal receipts in currency are not included as one of the most important cash inflows. This may seem to contradict his previous remark that over 80 percent of the total financial funds are collected and allocated through the national budget. This contradiction, however, is only apparent, for many important items of budget revenues take the form of credit entries into the Government account with the People's Bank instead of receipts of currency.

increases in savings deposits and sales bonds. The first alternative would turn inflation into its own cure, and would make a very efficient automatic stabilizer, but it had been resorted to only reluctantly and infrequently because of its unfavorable political consequences. Even during the great dislocation of supplies of the so-called Great Leap Forward period from 1959 to 1961, the Communist authorities had tried to maintain ostensible price stability by introducing rationing for staple consumption goods. According to Yang Po, writing in the *Peking Review*, November 1964, the price policy of the Communist government was to use price adjustment for the restoration of supply and demand equilibrium only in the case of individual nonessential consumer goods. If the commodities involved are essential consumer goods, rationing is always preferred to price increase, whenever supply fails to meet demand. In the case of aggregate demand for consumer goods outstripping aggregate supply, what they profess to do is, on the one hand, to readjust plans for the production of consumer goods and capital construction, and, on the other hand, to restrain appropriately the growth of aggregate purchasing power; *i.e.* by holding back wage payments, agricultural loans, etc. Since these readjustments in plans would necessarily take considerable time, in the meanwhile, as a temporary measure, rationing of essential consumer goods in short supply will be introduced and ostensible price stability maintained.¹⁹

Rationing, however, merely suppresses the symptoms of the disequilibrium between aggregate demand and supply in the case of rationed goods, but the disequilibrium would still express itself in bidding up prices or causing long waiting lines for unrationed goods in the urban markets and for goods traded privately in rural fairs. Moreover, rationing would not help the People's Bank to recapture the excessive amount of currency injected into the cash circuit.

The second alternative for the elimination of the disequilibrium in the cash circuit, *viz.*, an increase in taxes, would bring about the same result as the first, as there is no direct taxation on urban population. Thus the alternative that had been most frequently resorted to as a shortrun measure to cope with the inflationary gap in the cash circuit is the intensification of drives for savings deposits and sales of bonds. Whenever a gap is expected in the cash circuit that threatens to inject more and more currency into circulation, the ubiquitous party cadres would be directed to exhort the population to save more and buy more bonds. As exhortation of party cadres could easily shade into subtle intimidation and even open coercion, such savings deposits drives really assume some element of direct taxation and thus become hardly distinguishable from fiscal measures.²⁰

It is, however, very unlikely that with such rather unwieldy make-shift measures the Communist monetary authorities could always succeed in maintaining the desired balance between the cash inflows into and outflows from the People's Bank. In fact, undesired increases in currency circulation did frequently occur. For instance, in the 1957 fiscal report of the Finance Minister, Li Hsien-Nien, it was admitted that the expanded capital construction program plus the increases in agricultural loans and advance payments for state purchases of sub-

¹⁹ "New China's Price Policy," *Peking Review*, No. 47, Nov. 20, 1964.

²⁰ See D. Perkins, *op. cit.*, pp. 168-169.

subsidiary farm products during 1956 led to an increase of JMP \$1.6 billion in currency circulation at the end of 1956 compared with the end of the preceding year. Similar big undesired increases in currency issue must have taken place throughout the Great Leap Forward period, during which every financial caution gave way to exaggerated optimism of the cadres and blind faith in the capability of organized masses.

The rates of interest, which has been fixed around 5 to 6 percent per annum on industrial loans, are far too low to be an effective allocating criterion for short-term investable funds, while long-term fixed investments have been totally freed from considerations of the rate of returns, being financed entirely out of budget appropriation with no provision for repayment nor any interest obligations.

Thus, in Communist China, as the socialized sector grows and as the regime learned the technique of direct controls from the Soviet Russia, the economy has gradually assumed the features of a full-fledged command economy, in which monetary policy has less and less scope to operate. The cash plan appears to be the basis for monetary management in such an economy, but the only lever for monetary management in active use is the supply of currency in circulation. Even this lever is operated by measures, which really borders on fiscal measures, *viz.*, virtually forced savings.

The function of the market rate of interest as a mechanism for rational allocation of capital funds is certainly not unknown to economists in Communist China, as one may see from the early writings of such writers as Wang Wei-Ts'ai quoted above. Because of the violent antirevisionist movement that has been going on lately in China, however, recent demands in Soviet Russia and other Eastern European countries for more use of market mechanism in economic policy to insure more rational allocation of resources and greater efficiency have created only some faint echoes in Communist China. In December 1963, before the current storm of cultural revolution had started, there appeared in the academic journal *Ching-Chi Yen-Chiu* (Economic Research), an article by Yang Chien-Pai, entitled "National Economic Equilibrium and the Price of Production," in which he advocated the use of the "production prices" (or rather the costs of production as we would call it) as the basis for price fixing, instead of the nebulous rule of fixing prices on the basis of the Marxian concept of "value", *viz.*, "the amount of socially necessary labor embodied in each commodity."²¹ To compute the "production prices," he suggested that a national average rate of profit on capital should be used as the price for the use of capital in each enterprise, whether the capital is appropriated by the state budget or borrowed from the state banks. In effect, he is advocating the use of the computed average rate of profit as a substitute for market rate of interest to be charged on all uses of capital. Although his proposal still falls short of the modern concept of marginal cost pricing, it is a clear recognition that capital even in a socialist country is not without opportunity cost. With a great deal of circumlocution, and studiously avoiding any mention of similar changes going on in Soviet Russia and Eastern European countries, he put his proposal forward as a more rational reinterpretation of the Marxist Law of Value, not in

²¹ *Ching-Chi Yen-Chiu*, No. 12, Dec. 17, 1963.

supersession of the law. He also suggested that the actual rates of profit on capital achieved in different enterprises may be regarded as the gage for their performances.

Yang's idea was enthusiastically supported by two other economists, Ho Chien-Chang and Chang Ling, who followed up with a joint article in the same journal in May 1964, in which they enumerated the advantages of adopting the costs of production as the basis for pricing.²²

For the students of the politics of Communist China, it should be of interest to note these heretic articles appeared fairly closely after the Communist party dissenter Teng T'o made a speech at the annual meeting of the Economic Society of Peking held on June 27, 1963.²³

In that speech, Teng criticized the excessive emphasis laid on the development of heavy industries and capital construction to the neglect of consumer goods industries and agriculture, *i.e.*, the so-called Party's general line and Great Leap Forward, which he frankly pointed out as having brought about the reduction in output. He also suggested that "prior to the announcement of new economic policies and measures, more consultation should be held with economists, for in this way many mistakes can be avoided," and that "academic economists should be extensively engaged to take charge of economic operations".

Whether Yang, Ho, and Chang were encouraged by Teng's speech, we shall perhaps never know for certain. The Communist authorities in control, however, were obviously not receptive of Yang's idea. For soon after Ho and Chang's article appeared, the same journal devoted the leading articles of four consecutive issues (September to December 1964, inclusive) to the refutation of Yang's idea. Altogether six articles were published in the four issues denouncing Yang and his supporters.²⁴ This clearly indicated the official Communist attitude on this matter. It was expounded again and again that Yang's "Production Price Policy" would simply do away with socialist planned economy. One looks in vain for any rejoinders by Yang and his friends.

Soon the "cultural revolution" mounted up. Teng T'o himself became the main target of attacks together with his colleagues Wu Han and Peng Cheng. The men behind the Red Guards are certainly not likely to countenance such revisionist thoughts as giving greater scope for the price mechanism to operate in the economy. To the dictators in power, a command economy imparts more power of control to the authorities and hence appears more conducive to the perpetuation of their power. They are certainly not likely to be easily persuaded that it should be liberalized for the consideration of greater economic efficiency. How the economic system, in particular the money and banking system, of Mainland China would evolve must depend on the outcome of the political power struggle still going on there.

²² "Tentative Discussion of the Production Price in a Socialist Economy," *Ching-Chi Yen-Chiu*, No. 5, May 15, 1964.

²³ Teng T'o was an important party official in the Peking City Communist Party Committee, who published a volume of collected essays entitled *Yen Shan Yeh Hua* (Evening Chats on the Yen Mountains) which contains many criticisms of the Maost economic policy. His speech at the meeting of the Economic Society was reported in a sharply worded rebuttal in *Ching-Chi Yen Chiu*, No. 6, June 20, 1966. Other articles attacking Ten T'o also appeared in the same journal in 1966.

²⁴ See *Ching-Chi Yen-Chiu*, Nos. 9-12, September-December 1964.