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93d Congress
1st Session } JOINT COMMITTEE PRINT

SOVIET ECONOMIC PROSPECTS FOR THE SEVENTIES

A COMPENDIUM OF PAPERS

SUBMITTED TO THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

JUNE 27, 1973

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LETTERS OF TRANSMITTAL

JUNE 25, 1973.

To the Members of the Joint Economic Committee:

Transmitted herewith for use by the Joint Economic Committee, the Congress, and the interested public is a factual and analytical study of the economy of the Soviet Union entitled *Soviet Economic Prospects for the Seventies.* 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 data and interpretative comment on the domestic economy of the Soviet Union, including the record of recent economic development, and its relations with the outside world.

The agreements between the United States and the Soviet Union at the Summit meeting in May 1972 and the subsequent commercial agreement in October, 1972, open the prospects of new, hopefully more peaceful relations between our countries. We hope that this new environment will encourage the Soviet leaders to divert more resources to their domestic civilian economy and less to military programs which might threaten the peace of the world. This may, in turn, allow us to better meet our own pressing domestic needs.

It is hoped, that this volume drawing on research of American and British academic specialists as well as professionals in the United States Government will serve as an aid and a stimulus to scholarship on this subject. The Committee is deeply indebted to the scholars who gave so generously of their time and expertise. They are listed in the executive director's memorandum to me, and I would like to express on behalf of the Committee our gratitude for their invaluable efforts.

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

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

WRIGHT PATMAN,
Chairman, Joint Economic Committee.

JUNE 22, 1973.

HON. WRIGHT PATMAN,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a volume of materials on the economy of the Soviet Union entitled *Soviet Economic Prospects for the Seventies.* The study contains papers written by scholars and specialists who, as recognized authorities on the Soviet Union, were invited to contribute. The specialists in question have been drawn from the ranks of various universities here and abroad, private

research institutes, several departments of the Federal Government, and the Library of Congress. The papers they have submitted, in response to our request, cover the broad range of topics dealing with the recent performance of Soviet economy. Included among these topics are economic policy, the defense burden, agriculture, transportation, industry, population, education, research, science, international trade, shipping and foreign aid.

The Joint Economic Committee has undertaken a number of studies on the Soviet economy. Among the earlier studies were *Comparisons of the United States and Soviet Economies* (1959), *Dimensions of Soviet Economic Power* (1962), and *New Directions in the Soviet Economy* (1966). The latest of the Committee releases in the overall series was *Economic Performance and the Military Burden in the Soviet Union* (1970).

At a time when the relationships between the United States and the Soviet Union on arms control, and commercial, scientific, environmental and maritime affairs all are entering a new stage, an assessment of Soviet economic policy appears especially timely. Indeed after one of the poorest economic performances in Soviet history a special importance may be attached to a thoroughgoing professional assessment of current performance and future prospects.

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 also an essential analytical perspective. The individual scholars who have participated in the preparation of the present study are:

Herbert Block
David W. Bronson
Earl R. Brubaker
Keith Bush
Robert W. Campbell
David W. Carey
Stanley H. Cohn
Paul K. Cook
Douglas B. Diamond
Francis W. Dresch
M. Mark Earle, Jr.
Imogene U. Edwards
John T. Farrell
Murray Feshbach
Dimitri M. Gallik
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Franklyn D. Holzman
Raymond Hutchings
David K. Katz
Zev Katz
Barry L. Kostinsky
Constance B. Krueger
J. Richard Lee
Frederick A. Leedy
Herbert S. Levine
James H. Noren
Suzanne Porter
Bonnie Pounds
Stephen Rapawy
Wade Robertson
Gilbert Rodgers
Gertrude E. Schroeder
Barbara S. Severin
Nicholas G. Shadrin
Willard S. Smith
Leo Tansky
Vladimir G. Treml
F. Douglas Whitehouse
Edward T. Wilson
Kenneth Yalowitz

In addition, the Committee received the wholehearted cooperation from the following private organizations and Government agencies:

Bureau of East-West Trade, Department of Commerce
Bureau of Intelligence and Research, Department of State

Center of International Studies, Massachusetts Institute of Technology
Chatham House, Royal Institute of International Affairs [London]
Duke University
Foreign Demographic Analysis Division, Department of Commerce
George Washington University
Indiana University
Office of Economic Research, Central Intelligence Agency
University of Pennsylvania
Radio Liberty
Russian Research Center, Harvard University
Strategic Studies Center, Stanford Research Institute
State University of New York (Binghamton)
Fletcher School of Law and Diplomacy, Tufts University
University of Wisconsin
Wellesley College

It should be clearly understood that the views expressed in these papers are those of the individual contributors and do not necessarily represent the position of their respective government, or non-government institutions, the Joint Economic Committee, individual members thereof, or the Committee staff.

The Library of Congress made available the services of John P. Hardt, senior specialist in the Congressional Research Service, who helped to plan the scope of the research, coordinated and edited the contributions, and wrote a Summary for the present study. Dr. Hardt was assisted by George D. Holliday, also of the Library staff.

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

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SUMMARY

By JOHN P. HARDT

A new era of international and commercial relations was announced by the Soviet and United States leadership after the Summit agreements of May 1972 and the commercial agreements in the fall of 1972. Yet the Soviet military establishment and Soviet foreign policy remain the primary rationale for the United States' national security outlays. Even with a smaller economy than the United States the Soviet Union continues to allocate in quantity and quality a comparable absolute amount of goods and services to military, space and aid.

With the adoption of the Ninth Five-Year Plan for the years 1971-1975 Soviet leaders underlined the importance of technological change and improvement in the level of consumption. The increased emphasis on investment to modernize their economy and the attention to consumer needs brought to the fore the question of civilian vs. military programs. Technological change also increased the Soviet interest in expanded commercial relations—especially those involving technological transfer—with the United States, Western Europe and Japan.

At a time in 1972 when economic performance was most important to fulfilling Soviet aims they suffered one of the worst years in the history of their planned economy—a GNP growth of close to 2 percent. Not only was the overall growth held down by an agricultural disaster, but other sectors also fell short of plan. As agriculture still represents about one quarter of the Soviet gross national product it was clearly the major culprit (see Table 1).

TABLE 1.—U.S.S.R.: INDEXES OF GNP AT FACTOR COST, 1970-72 [1]—1968=100

	1968 weights, percent	1970	1971	1972
Industry and construction	39.2	112.7	120.0	126.2
Agriculture	24.4	109.5	108.0	97.3
Transportation and communications	6.8	114.9	118.8	124.8
Trade and services	29.6	109.7	114.6	120.0
Trade	6.9	115.6	123.5	132.0
Services	22.7	107.9	111.9	116.3
GNP	100.0	111.0	115.4	117.2

[1] These figures are based on data provided in various articles of this volume.

In the 30 chapters of this compendium some 40 specialists from government and academic institutions in the United States and Europe have assessed the recent Soviet economic performance and its implications for the future. The chapters in the compendium are arranged in 7 sections: Plan and Policy, Resource Claims of the Soviet Military Establishment, Industry, Agriculture, Consumption, Human Resources and Education, and the Foreign Economy. Most of the

authors have provided their own summaries and the reader may wish to make up his own mind on differences of professional viewpoints. The following are some of the major questions raised by the papers with an indication of answers and where in the volume the appropriate analysis may be found.

1. How do the Soviet leaders view the economic issue in their policy deliberations? Is there a new strategy for economic development? How were priorities changed in the current Ninth Five-Year Plan (1971–75) and the economically disastrous year 1972?

Key economic decisions are still concentrated in the hands of the top Party leaders, Leonid Brezhnev, Alexei Kosygin and other members of the Politburo. (Cook, p. 6.) Although important issues have been raised—such as the Stalinist emphasis on heavy industry, military prowess and the centralized planning and management system—the changes have not been far-reaching or dramatic, even under the stress of poor performances in 1972. Still the long-held Stalinist view of autarky or self-sufficiency in foreign trade has been challenged if not replaced in the new era of Soviet-United States commercial relations (Wilson, Katz, Porter, Pounds-Rodgers, p. 643.)

The Soviet leaders are in the process of adopting a new economic strategy by: (1) altering current output to favor consumption; (2) changing the composition of investment to increase consumer goods production capacity; (3) emphasizing technological change, improved management, and increased productivity (Campbell—Earle—Levine—Dresch, p. 139). Although technological change and improved standards of living for consumers were featured in the discussions of the Ninth Five-Year Plan at the Twenty-Fourth Party Congress, the short-term changes away from traditional military and heavy industrial claimants are modest. Moreover, the shortfalls of 1972 make it unlikely that even the modest goals for technological change and improved consumer welfare will be attained. (Bush, p. 44, Block, pp. 199–200.)

2. The current Ninth Five-Year Plan has been described in more detail than any similar plan in 30 years. Was the planning process improved for the development of this current plan? Is the current Five-Year Plan internally consistent and feasible?

Although the State Planning Committee was directed to use the 1966 Soviet input-output table as a basis for formulating the plan, it was apparently prepared by traditional methods (Treml—Kostinsky—Gallik, p. 250; Schroeder, p. 27). However, using a version of the Soviet 1966 table and other Soviet data it is possible to conclude that the published plan was neither internally consistent, nor feasible. Given the unanticipated poor performance in 1972 the goals for 1975 seem even less attainable.

The 1971–75 plan for Soviet industry is probably over-ambitious.* * *

A test of the plan's consistency, performed with the help of a newly available input-output table, suggests that the scheduled production of metals, timber, and possibly electric power will be insufficient unless the USSR shows unprecedented progress in economizing on materials and power in production and in substitution of more abundant materials for those in short supply.

The plan is strained in another direction. To support the projected growth of industrial production of 8 percent per year, the 1971–75 plan calls for an increase of about 4½ percent per year in the combined inputs of manhours and fixed capital—appreciably less than the average annual increases in these inputs of 6.4 percent and 5.5 percent recorded in 1961–65 and 1966–70, respectively. Thus, factor

productivity will have to rise by 3.7 percent per year to satisfy the plan goals, three times as rapidly as the average of the past decade.

Because the productivity goals are so high . . . the goals for technical progress take on added importance in the 1971–75 plan. Although the technological goals depend to some extent on the acquisition of foreign technology, technical progress in the Soviet Union must be based primarily on the performance of the Soviet machinery sector. . . . The planned growth of producer durables—13.4 percent per year in 1971–75—is far greater than was accomplished in 1966–70 and is unlikely to be achieved. Reliance on foreign technology is most acute in the oil and gas industry, certain chemical sectors, the truck industry and the instruments—computer sector. The USSR's sources of foreign exchange, however, are limited, and the 1972 grain purchases probably have already forced a slowdown in the planned growth of imports of Western machinery and equipment.

The fortunes of three other sectors—ferrous metals, petroleum products, and chemicals—are also crucial to the fulfillment of the industrial plan.* * *

Because of the tightness of the 1971–75 plan, the contrast between plans and past performance, and the rocky beginning thus far, the plan for industrial output is unlikely to be fulfilled. (Noren-Whitehouse, pp. 207–208.)

Soviet leaders have shown increasing interest in two other goals. Somewhat belatedly they have recognized a need for comprehensive policies in technological change (Hutchings, pp. 71–86) and environmental protection. (Goldman, pp. 56–70.) The seriousness of their efforts to deal with the problems of technology seem far greater than their commitment to protecting the environment.

3. For some years Soviet leaders have accepted the need for reform in planning and management. What is the record to date and prospects for future change?

Changes in planning and management under current Soviet leadership have focused on the following aims: (1) an increased role for five-year and longer-range plans; (2) the efforts to devise more "scientific" bases for plans, of whatever kind and duration; (3) detailed planning for technological progress, improved product quality, and economic efficiency; and (4) the use of mathematical models and computers, including input-output techniques. (Schroeder, p. 13.)

The result to date has been the uncertain establishment of the research base for significant future changes in the entrenched Soviet planning and managerial institutions and the more certain increase in the size of that bureaucracy. (Schroeder, p. 38.)

At the same time it appears the official tolerance of an "unofficial" economy may have reduced the pressure for reform in incentives. According to some Soviet emigre interviews, "grey" and "black" markets and second jobs or "moonlighting" may be widespread in the U.S.S.R. To put it another way, the informal activities revealed recently in the Georgian Republic may be typical and all-pervasive. (Katz, pp. 88–94.)

4. In the last decade Soviet allocation of resources for defense has permitted a strategic weapons buildup sufficient to claim parity with the United States and a military manpower increase sufficient to meet additional felt needs on the China border and in Czechoslovakia. Has the burden of Soviet defense increased? What are the opportunities foregone by the continued top priority for defense? How accurate are our measurements of these military outlays and the defense burden?

By some estimates, the Soviet defense burden has not been rising and is no greater than that of the United States. (Block, p. 190.) Moreover, the military and civilian sectors of the Soviet economy are considered separate and distinct:

The two sectors operate on different technical levels, and according to quite different rules, and with a considerable secrecy barrier. It is clear that the leaders have had a very difficult time trying to transfer to the civilian sector the managerial techniques, the innovative behavior, and high quality that seem evident in the military and space sector. (Campbell, Earle, Levine, Dresch, p. 136.)

As completion of the Ninth Five-Year plan is closely tied to performance in their machinery sector (Noren-Whitehouse, p. 214), any diversion of resources to or from military programs might be critical to success in plan fulfillment. Still "there appears to be strong evidence to inverse movement between defense expenditures and those for both capital investment and private consumption. . . . We can draw a tentative conclusion from econometric analysis that Soviet defense expenditures have adversely affected Soviet economic growth". (Cohn, p. 153, 154.)

Likewise, the opportunity costs for military manpower are significantly understated by explicit Soviet manpower costs (Brubaker, p. 174). Indeed nonfulfillment of the Plan or resumed demobilization of military manpower may be a choice forced upon the leadership.

Thus, given the constraints on the labor supply, the relative scarcity of hard currency to buy all the capital equipment needed to raise the capital/labor ratios, the exacerbation of the situation caused by 2 years of agricultural difficulties, the continued underfulfillment of labor productivity goals, and assuming no significant entry of foreign labor, few or no choices appear to be open other than to reduce the goals of the plan to reflect the amount and quality of labor available. Could a significant demobilization be subject to consideration by the Soviet Government and Party? (Feshbach-Rapawy, p. 506.)

The adverse effects of military programs on Soviet economic performance may have influenced the Soviet positions on Strategic Arms Limitation Talks (SALT) and Mutual and Balanced Force Reduction (MBFR) discussions.

5. Agricultural output has played a more important role in economic performance in the U.S.S.R. than in the United States. How did agricultural performance change in the two countries in recent years? What special problems arose in the Soviet economy because of the poor 1972 agricultural output?

Although the farm sector's contribution to GNP has fallen rapidly over time, farm output in the USSR still accounts for more than one-fifth of the Soviet gross national product (GNP) and employs one-third of the labor force. In the U.S., on the other hand, agriculture contributes just 3¼ percent of GNP and employs 5 percent of the labor force. (Whitehouse-Havelka, p. 341.)

Net farm output rose more rapidly in the Soviet Union than the United States. Growth indices for agricultural output (1966–1971 compared to 1950–1955) were 184 for the U.S.S.R. and 132 for the United States (Whitehouse-Havelka, p. 345).

6. Consumerism is said to have come to the Soviet economy. Is this assertion valid in terms of changed priorities, plans, and performance?

It is not so much that goals are higher or programs are different, but the leadership now seems serious about meeting consumer needs. Satisfying the Soviet consumer, however, is becoming more difficult.

* * * In recent years, there has been a buyer's market for almost all consumer manufactured goods—with the major exceptions of automobiles and quality foods such as meat. . . . The availability of automobiles during the current planning period is a major issue. If plans are met, car sales to the public during 1971–75 could absorb approximately one-sixth of the 60 billion rubles currently held in saving accounts and thus ease inflationary pressures while boosting consumer morale. . . . It is estimated that in 1975 there will be about 3 million

privately owned cars in the USSR, nearly three times the number in 1970, but still only about one car per 100 Soviet citizens. (Bronson-Severin, pp. 386–388.)

In spite of a disastrous year in agriculture the livestock herds have been fed imported grain, thereby keeping alive ambitious plans for increased meat output. (Diamond-Krueger, p. 327.) However, while "diets have improved—more meat and other quality food and fewer starches are on the nation's tables." ". . . the Soviet regime has not yet satisfactorily solved that most basic of problems—providing the population with a quality diet." (Bronson-Severin, pp. 376–377.)

In housing, another key consumer area, the record is even less impressive:

At the present rate of increase in housing stock in urban areas at least six more years will be required to provide each family with its own unit. . . .

Quality of construction by Western standards is shoddy and the design unimaginative. Moreover, approximately 20 percent of urban state housing still is without running water and sewerage, and for all housing, rural and urban, this figure probably exceeds 50 percent. Useful space available per person has increased in the last ten years from about 9 square meters to 11—which is still little more than half that provided in most Western European countries. (Smith, p. 405.)

Even for autos the availability of more vehicles is tempered by the shortage of filling stations, repair garages, and usable roads.

Moscow's 100,000 privately owned cars presently are serviced by only 12 filling stations and three repair garages. The country's entire inventory of 800,000 privately owned cars is served by only 370 repair garages, or one garage for each 2,200 cars. Many cities have few, if any, repair facilities. Under the current program of expanded output and sales to private individuals, about one million new cars a year will be added to the passenger car inventory by 1975, swelling the demand for service facilities to overwhelming proportions. . . .

Although twice the size of the United States, the Soviet road system is about one-fourth as long—847,500 miles in 1971—excluding urban streets and roadways. Moreover, only 16 percent is paved with asphalt or cement and 24 percent with gravel, making the total of hard surface roads only about 40 percent of the system. Thus, 60 percent of the system is made up of dirt roads, impassable to ordinary traffic in wet weather. (Edwards, pp. 303, 311.)

On the other hand, an increase in money wages has also been accompanied by a more egalitarian income distribution "* * * the narrowing of wage differentials in the U.S.S.R. over the past two decades has been enormous." (Bronson-Severin, p. 379.) This "income revolution," reviving the old Marxist concept of an egalitarian society, may encourage the recent interest of Soviet sociologists in social differentiation (Katz, 94–102.)

7. The first census since 1959 is now available for analysis. What does it show? Will manpower shortages constrain Soviet economic performance in the future? To what extent is the labor shortage a problem of inadequate skills? Will the investment in education help overcome labor quality problems?

The dominant features of the demographic trends in the Soviet Union during the 1960's were the steadily declining fertility and the concomitant decreasing rate of population growth. * * *

If fertility remains constant at the 1971 level, the total population of the USSR is projected to be about 320 million on January 1, 2000, an increase of nearly 71 million (29 percent) over the total of 249 reported for January 1, 1973. If fertility declines, as it has done over the past decade, the total is projected to be between 292 and 306 million at the beginning of 2000, or an increase of between 18 and 23 percent over the projection period. (Leedy, pp. 429–430.)

The differential rate of population growth among Soviet nationalities may be as disturbing to Soviet leaders as the general decline in

the rate of expansion. The European areas—including the dominantly Great Russian areas are—below average, while the Central Asia Republics have the most rapid population growth. This may further encourage Soviet leaders to adopt an explicit policy for encouraging population growth in low birth rate areas.

Declining growth of the labor force is a constraint on current and future Soviet plans;

* * * Perhaps the most direct evidence of the constraints in labor supply under which the Soviet economy currently operates are the Ninth Five-Year Plan projections of growth in industry. In contrast to the previous pattern of a 3 to 4 percent annual average rate of growth of industrial employment, the current plan calls for only about 1.3 percent per year, with output increasing almost entirely as the result of increased labor productivity. (Feshbach-Rapawy,, p. 485.)

In view of the shortfall in the planned increase in labor productivity in 1972, it now appears that labor availability will prevent completion of the Ninth Five-Year Plan. Moreover, the labor constraint during the Tenth Five-Year Plan is likely to be more severe.

The education system affects the quality of the labor force.

* * * the USSR now claims that 99.7 percent of the population is literate, compared with only 44 percent in 1920. * * * Universal eight-year education has been achieved and progress is being made on providing universal ten-year education for all youths. Despite these efforts, however, the labor force is not as highly trained as the recent accomplishments in education imply. * * * Presently about one-third of the Soviet labor force has less than 8 years of education and not even one of every ten workers has finished college. (Carey, p. 623.)

Soviet education has favored engineers and scientists.

As long ago as 1950 the number of persons working in Soviet R&D was half again as large as the number working in R&D in the United States. During 1951–70 the USSR enlarged its R&D labor force at a substantially greater rate than did the United States—9.3 percent per year compared with 6.3 percent per year. As a consequence, total R&D employment in the USSR grew to more than 2½ times the U.S. level by 1970. * * *

There is, however, no Soviet advantage in the number of scientists and engineers conducting or managing R&D projects; according to the estimates presented above, the USSR had 494,000 of these people in 1970 while the United States had 545,000. Bronson, p. 580.)

8. Increasing commercial relations with the United States and the other economically developed nations are considered to be of political benefit as a stabilizer in international relations. How significant is trade with the developed economies to the performance of the Soviet economy? What are the limitations on increases and prospective future levels of economic interchange? Are the expansions of Soviet shipping and of military and economic aid primarily political or economic developments?

The trade agreement of October 1972 continued the pattern of normalization of United States-Soviet relations begun at the Moscow Summit in May 1972. Agreements on debts, business facilities, financing, shipping and related matters opened the prospect of substantially expanded trade. However, many issues remain, especially the granting of most-favored-nation treatment by Congress. Other issues related to commercial relations will be taken up by the Joint U.S.-U.S.S.R. Commission, which was established as a continuing body. (Wilson, Katz, Porter, Pounds, Rodgers, pp. 657–659.)

Although many of the constraints on trade have been reduced or eliminated, different problems have come to the fore, including those

related to joint investment projects and convertibility. These involve not only legal barriers but also differences in the economic systems of the two countries. (Holzman, pp. 682–689.) Industrial cooperation between the United States and the U.S.S.R. requires serious negotiations and significant political and economic concessions on both sides (Yalowitz, pp. 717–718.)

The major obstacle to expanded Soviet commercial relations with the West is obtaining financing for Soviet imports.

As a result of Soviet inability to expand its exports to hard currency countries rapidly enough to pay for growing imports, the Soviet trade balance with these countries has been in deficit throughout the period 1960–71, averaging about $270 million per year. In 1972 large imports of Western grain contributed to a record deficit of at least $600 million. Until the mid-1960s, these deficits were financed primarily by gold sales and, to a lesser extent, by Western government-guaranteed medium-term credits. * * *

Dwindling gold reserves and the greater availability of Western credit resulted in increased use of Western government-guaranteed medium- and long-term credits, which replaced gold as the chief element in financing the Soviet deficit with the West. (Farrell, p. 691.)

Gold sales totaled $250–300 million in 1972. With the higher price for gold in Western markets, the Soviets may increase their exports in order to finance imports from the West. Soviet exporters also hope to increase their sales of valuable raw materials, especially petroleum products and natural gas. However, without massive East-West joint ventures, prospects for increased petroleum and natural gas exports seem dim in view of Soviet production problems and increasing domestic and East European demand. (Campbell, pp. 47–49; Lee, p. 290.)

The shortage of hard currency explains the eagerness of Soviet leaders to enter coproduction arrangements with Western firms.

To assure adequate hard currency supplies in the long term, the U.S.S.R. is trying to develop export-oriented production, financed by credits which will be repaid from the new production. Already in 1973, self-liquidating contracts account for about 20 percent of Soviet repayments on an estimated outstanding long- and medium-term debt of more than $3 billion. Many of the large joint ventures the U.S.S.R. is discussing and negotiating with the West—the proposed LNG deal with the U.S. and a variety of oil, gas, and mineral development projects—call for self-liquidating credits. (Farrell, p. 695.)

Soviet interest in expanded foreign economic relations extends to commercial ties with the developing nations. Soviet foreign aid programs initiated after Stalin's death have retained their largely political character. However, they are also partially motivated by economic considerations.

The basic objectives of the U.S.S.R. in dispensing aid have remained stable over this period—to expand its influence at the expense of the other major powers and to offer itself as a model for economic development for the recipient countries. Although these political and ideological motivations remain the major determinants for Soviet aid programs, economic considerations also are becoming important. Many recent aid agreements have been designated largely to increase imports of fuels, raw materials, and consumer goods and to create markets for Soviet machinery and equipment. (Tansky, p. 766.)

As a result of expanded Soviet foreign economic activities, the Soviet merchant marine fleet grew at a far more rapid rate that the economy as a whole. The October 1972 U.S.-U.S.S.R. maritime agreement, combined politics and economics.

Fishing, the Northern Sea Route in the Soviet Arctic, and maritime relations with the nations of the COMECON or CMEA all have economic and political aspects.

While substantial political and military benefits have been obtained by the accelerated development of the Soviet Merchant Marine, the prime reason for its expansion was economic. The major reasons for expansion were to provide transportation for Soviet foreign trade and to improve Soviet payments in hard-currency trade, especially by reducing the drain of hard-currency caused by charter of foreign vessels. (Shadrin, p. 721.)

Comparative Soviet-United States Economic Development

With a larger population the Soviet economy still produces less goods and services than the United States economy (Table 2). In fact, the gap between to Gross National Products (GNP) of the two countries has not been narrowing in spite of more rapid growth in the output of Soviet industry and agriculture and a proportionally larger increase in investment since 1960. With a larger labor force the Soviet economy is faced with problems of labor shortages while the United States economy is plagued by a continuing labor surplus.

Comparable allocations of resources in each country to national security programs place constraints in each case on the funding of civilian programs to modernize the economies and improve the quality of life. The preemption of scarce capital and manpower by the military acts as the primary constraint on Soviet civilian programs; whereas fiscal constraints—the availability of tax revenue within the existing tax structure—appear to be more important in determining the level of Federal government programs for civilian improvement in the United States. Whether the burden or opportunity costs of military programs are higher in the Soviet Union or United States probably turns on the subjective value of the options forgone.

TABLE 2.—ECONOMIC INDICATORS[1]

	U.S.S.R.			United States	
	1970	1971	1972	1971	1972
GNP (billion 1971 U.S. dollars)	551	570	580	1,050	1,118
Population, midyear (million persons)	242.8	245.1	247.5	207.0	209.0
Per capita GNP (1971 U.S. dollars)	2,269	2,326	2,343	5,072	5,349
Industrial production index (1960=100)	195.2	207.0	217.5	161.3	172.7
Net agricultural production index (1960=100)	144.4	144.6	134.7	123.3	124.4
Total labor force (including the armed forces), adjusted annual average (million persons)	124.2	126.0	128.1	86.9	89.0
Nonagricultural, adjusted annual average (million persons)	86.7	89.1	92.1	75.7	78.2
Agricultural adjusted annual average (million persons)	37.5	36.9	36.0	4.5	(2)
Total investment index (1960=100)	195.3	208.7	223.2	146.7	(2)
Per capita consumption index (1960=100)	147.8	153.5	158.7	135.9	(2)

[1] Based on appropriate chapters in this volume. See also annex A of Peter G. Peterson, "United States-Soviet Commercial Relationships in a New Era," Department of Commerce, August 1972.
[2] Not available.

Problems and Prospects

The economic record for 1972 was one of the worst since the First Five-Year Plan was introduced. It may be that the economy cannot recover rapidly enough to meet even the major goals for the Ninth Five-Year Plan. However, we should be cautious in interpreting the likely shortfall in the current plan. First, the Soviet economy tends to revive rapidly from years of poor performance, especially when weather is a major adverse factor. Second, the Soviet economy may average a growth rate of 4–5 percent per annum for the Five-Year

Plan period (1971–75) and still fall short of planned targets. Although disappointing, that rate of growth would provide considerable additional resources for the programs the Soviet leadership wishes to emphasize.

Regardless of the level of performance in the next several years, the Soviet leadership would doubtless prefer to expand their economy at a more rapid rate during the Ninth and Tenth Five-Year Plans, i.e., during the 1970s. A number of factors will influence the likely performance of the Soviet economy. The following is a partial list of prescriptions for improved economic performance:

Reduce military claims on resources and speed the transfer of human and capital resources released from military programs to civilian production.

Streamline planning institutions and management mechanisms to meet demands.

Expand commercial relations with developed nations to facilitate technology transfers.

In order to meet the above prescriptions the Soviet leadership may have to be far more flexible in their policies than history suggests is likely. Deemphasis of the military and heavy industry run counter to the entrenched interests of important segments of the Soviet elite. Significant changes in planning and management would result in a diffusion or redirection of economic power and control in the Soviet system. Thus the economic role of the Party might be at stake. Changes in relations between the Soviet economy and the non-Communist world might mean renouncing the Stalinist concept of autarky and isolation and joining the international commercial and financial community. Thus, the political costs for improved economic performance might be high, perhaps too high. Those who choose to extrapolate past performances—most of the authors in this volume—would expect little major change in internal priorities and scant economic reforms. Others, however, argue that a turning point in foreign economic relations has been reached. Perhaps we should not discount the prospects for significant change in the Soviet domestic economy.

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Part I. PLAN AND POLICY

THE POLITICAL SETTING

By PAUL K. COOK

The fact that the Soviet Union and the United States possess the capability to obliterate each other within half an hour or so—and in the process destroy life on this planet—is universally acknowledged. The superpowers themselves gave recognition to this fact at the Moscow Summit in May 1972 when we, if only imperfectly, agreed that there should be limits to the arms race.[1] We admitted to each other and to the world that better use can be made of man's ingenuity and of the earth's resources than to develop even higher overkill ratios.

But the participants, in subscribing to the principle of peaceful coexistence, also went on the proclaim that we are and will remain adversaries. As Politburo member and Party Secretary Mikhail A. Suslov put it following the Summit, "We Communists have no illusions about the antipopular nature and policy of imperialism . . . The assertion of the principles of peaceful coexistence in international affairs in no way signifies the weakening of the class struggle . . . or a "conciliation" between socialism and capitalism . . . Now when the imperialists are increasingly realizing the impossibility of overthrowing socialism by force, this struggle is more frequently being transferred to the spheres of ideology, politics and economics.[2] "

But while we remain adversaries, the nature of our relationship does appear to be changing. To be sure, competition in military affairs persists as each side seeks breakthroughs in weaponry. There may be some merit in the theory that each side is adapting and eventually the systems will converge, but the dissimilarities are presently so profound that the point of convergence, if it exists, is still far over the horizon. Moreover, it is abundantly clear that ideolgical rivalry will continue, and to the extent that Soviet nationalism is substituted for the Marxist-Leninist Writ, the Kremlin's suspicions of and hostility toward the West may even be strengthened.

Several factors, however, are working against the assumption that the Soviet Union and the United States are on a fatal collision course. Undoubtedly foremost is the mutually admitted nuclear stalemate. Another factor is the Soviet Union's belated acceptance of its need of foreign economic aid and U.S. recognition that its policy of virtual economic isolation of the Soviet Union has largely outlived its usefulness. Both sides recognized at the Summit and at the initialing of the Trade Agreement in October 1972, that mutually beneficial results could ensue if our trade relationships were "normalized."

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[1] For the texts of the SALT and other agreements reached at the Moscow Summit, see 92d Congress, 2d sess., Executive L, June 13, 1972, 65–118. The Soviets also published the various agreements with the notable exception of the Protocol attached to the Interim SALT Agreement. President Nixon's TV address to the Soviet people was also published but in an abridged version which omitted, inter alia, his sympathetic references to Tanya, the little girl who, with all of her family, perished during the siege of Leningrad.

[2] *Pravda*, December 15, 1972.

There are, on the other hand, numerous obstacles on the path of developing natural trade relationships, not the least of which at present is the Soviet need of massive foreign credits—for it lacks sufficient goods and services to balance its import requirements—and U.S. Congressional reluctance to grant most-favored-nation tariff status as long as the Soviet Union arbitrarily denies its citizens the right to emigrate freely. But the fact remains that the Soviet Union and the United States have agreed to cooperate, not just to compete economically.

If economic cooperation is to be achieved on terms which would benefit the United States as well as the Soviet Union, it behooves us to learn as much as possible about our potential customers. Or, to paraphase the salesman protagonist in *The Music Man*, "We gotta know the territory!" Unfortunately, though this volume and its predecessors help, there remain voluminous gaps in our knowledge of even what appear to us to be simple facts, such as the names and responsibilities of government officials below the highest levels. This is so in large part because of an obsession with secrecy which antedates the establishment of the Soviet Union, of a highly paternalistic attitude to the people's right-to-know.[3] As a result, much of what is known about things Soviet has been divined only by dint of arduous sifting of the bits and pieces of what passes for evidence in the field of Soviet studies. The imperfect results are often only "best guesses" and no one has a monopoly of truth.

The question remains, however, what has led the Soviet Union to give up Stalin's cherished dream of economic autarky, of total self-reliance economically, and to seek to develop large-scale trade with the United States? It certainly was not due to an altruistic desire to fatten the coffers of American corporations, nor to solve what has become known as our "energy crisis" through supplying liquified natural gas, though the latter is now being held out as bait for truly massive, long-term investments in Siberia. Rather it appears that the leaders of the Soviet Union have come to recognize that realization of the industrial revolution is no guarantee of attainment of the technological revolution now sweeping the West. The Soviets have found that in order to get on the technological bandwagon they must have access to Western suppliers. And the United States, because of its economies-of-scale, constitutes the best bet.

Much has been written in the West this past year regarding the troubles besetting the Soviet economy, albeit some of it has been cast in rather sensationalist terms. It is true, however, according to official Soviet statistics, which are usually inflated, that the growth of national income in the U.S.S.R. in 1972 was one-third below expectations and was the lowest recorded in more than 25 years.[4] Most of the difficulty, of course, stemmed from the extremely poor agricultural year which resulted in the importation of more than 29 million metric tons of food and feed grains from the West at a cost of about 2 billion dollars. In-

[3] The most recent public telephone directory of Soviet institutions in Moscow, a city of some 7 million, was published in 1968 in an "expurgated" edition. For example, there are no more than half a dozen entries for the Central Committee of the Communist Party, Council of Ministers, or individual ministries. Similarly, Soviet maps of Moscow are so deficient in information that most foreigners have to rely on a map published by the US Army Map Service!

[4] *Pravda*, December 19, 1972 and *Pravda*, January 30, 1973.

dustrial production, too, fell below its planned rate of growth primarily because of unrealistically high expectations for labor and capital productivity gains. Together, they have forced major changes in 1973 plans: all major economic indicators, except farm output, have been markedly—in some cases drastically—reduced. The greatest loser this year is the consumer. Planned output growth of consumer goods in 1973 was cut by 44 percent, whereas growth of producers goods was reduced by only 17 percent.[5] The outlook for the consumer in the long run may not be as dark. Investment in consumer goods industries remains high and the Soviets have evidently decided to continue to improve the quality of the diet through expansion of meat production. On the other hand their commitment to improve services to the population seems less firm. The 1973 agricultural goal, moreover, appears overly ambitious. Military expenditures in the overt budget are scheduled to remain constant, but, with the large increase in the "science" entry, will probably continue to grow appreciably. Soviet officials have not mentioned plans for the other remaining years of the current Five-Year Plan (1971–75), but their downward revision appears inevitable.[6]

It must be remembered, however, that while recent performance and immediate prospects are dim, they deal only with growth. The Soviet economy is not in a recession, much less a depression. In economic terms *per se*, there is no crisis. Only if one looks to the future is it possible to predict that if the present situation persists the Soviet Union will be falling ever further behind the West economically. On the other hand, the political ramifications of the present state of the Soviet economy are far greater than the economic indicators alone would suggest. To point out the most obvious, the situation is undoubtedly causing some diminution of self-confidence among the Kremlin leaders who still subscribe to the belief that "scientific communism" is the key to the future. It is also probably generating considerable chagrin over the shadow that these problems cast on their touted image of the Soviet Union as an "equal" superpower with the United States.

How is it that a nation with a military prowess on par with that of the United States, with a population of almost 250 million, with a territory encompassing virtually one-sixth of the earth's land mass,[7] finds itself in such economic straits? The reasons are many and varied, each of which provides only a partial answer. One is readily apparent: with a national income only about half as large as that of the United States, the Soviets have been spending virtually as much as the United States on their military establishment, thereby siphoning off the most skilled manpower and high quality resources from growth producing investment.[8]

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[5] The current 5-year Plan adopted in 1971 had altered the traditional priorities by setting the rate of growth of consumer goods slightly above that of producers goods.

[6] One long-time observer of the Soviet scene, when apprised of the changes in the 1973 plan occasioned by the poor performance in 1972, asked, what else is new? Whenever the going gets rough, it is the consumer who gets it in the neck while the military forces fare well. However, the high priority accorded agriculture, while unrealistic, is a relatively new phenomenon.

[7] The Soviet Union is 11 time zones wide and stretches further North to South than the US does East to West. Siberia alone is larger than the visible surface of the moon.

[8] US Department of State, *USSR Facts Book*, May, 1972, p. 3, estimates that the Soviets spent more than $75 billion dollars in 1971 prices on their military establishment, as measured in prices they would have had to pay in the United States. Other estimates using different methodologies vary, but all appear to agree that the burden of military expenditure is greater on the Soviet than the U.S. economy.

Some observers point with considerable justification to the geographic disabilities of the Soviet Union. Despite its vast size, most of the country lies north of the parallel separating the U.S. from Canada and is far removed from the moisture-bearing winds of the Atlantic. Thus, they aver, its economic difficulties stem largely from a harsh climate which intermittently is particularly inhospitable, as in 1971–72. Such geographic determinists, however, tend to ignore the fact that a nation with comparable soil and weather conditions, such as Canada, somehow seems to survive and prosper to a far greater extent than does the Soviet Union.

Other commentators, more ethnically oriented, attribute Soviet "backwardness" to the relatively low educational and technical culture of the Soviet people.[9] It is true, of course, that almost half of the Soviet population is rural and that the majority of the urban population is at most a generation removed from the peasant household, and as a result, performance in non-priority sectors, such as public services, can be frustrating. Yet a dispassionate observer with knowledge of history who recalls the genius of the likes of Mendelevich, Lomonosovskiy, Tsiolkovskiy, and Korolev, not to speak of the contributions of personages of Russian heritage resident in the West, would be extremely reluctant to disparage the native talents of the Soviet peoples.

The Soviets themselves, when pressed, are wont to attribute current difficulties to the losses suffered during World War II. More than 20 million lives were lost, roughly the equivalent of the metropolitan areas of New York, Chicago, and Los Angeles. As anyone who has visited with Soviets is aware, the effect of war losses is still horrendous. But advocates of their persuasion also tend to overlook that West Germany and Japan suffered even more, relatively speaking, than did the Soviet Union. And their economic growth and standard of living today significantly exceeds that of the Soviet Union. To the extent that such facts are recognized, the usual Soviet rationale attributes the present affluence of West Germany and Japan to U.S. aid, ignoring the equally incontrovertible fact that the U.S.S.R., too, could have benefited from participation in the Marshall Plan and, at least theoretically, from subsequent American assistance. But Stalin turned down these offers of aid not only for the Soviet Union, but also for the Communist states of Eastern Europe.

Another feature, oftimes treated slightingly by Western economists but at least equal in importance to any of the foregoing, is that the Soviet system of rule is one of the most highly politicized the world has ever seen. It not infrequently inhibits if not prevents the attainment of policy goals. Numerous examples exists, such as the decades during which Albert Einstein's theories were *verboten* because they challenged the official ideology as then interpreted. Similarly, Norbert Wiener's pioneering works on cybernetics were banned for years, a fact which severely retarded the development of the computer technology the Soviets are now so desirous of obtaining from the West. Though Soviet science made great strides in spite of these short-sighted

[9] Despite admirable achievements in overcoming such features as functional illiteracy, the average level of educational attainment for Soviet adults is only 7 years, compared with about 12 in the US. American universities continue to graduate almost twice as many students as Soviet institutions of higher education. Ann S. Goodman and Murray Feshbach, *Estimates and Projections of Educational Attainment in the USSR* (Washington, D.C., 1967), pp. 4, 16.

strictures, all too often it was forced to subscribe to the "get-rich-quick" theories of the likes of the quack geneticist Trofim Lysenko whose officially sanctioned *diktats* contributed much to the failure of Soviet agronomists to develop high-yield seeds, and thus to the poor performance of the agricultural sector.

The Soviet Union thus is suffering in a very real sense from past mistakes caused by its all-embracing totalitarian system of rule. It is all-embracing in that the Soviet "civil service" consists of almost 100 million white and blue collar workers who comprise the entire national labor force aside from roughly 25 million semi-autonomous peasants who work on collective farms. Their day-to-day activities are administered by a vast bureaucracy whose primary concern often appears to be the protection of its rights rather than the welfare of its clients. Overseeing its operations are several-hundred thousand members of the Communist Party apparatus who set policy and strive to ensure its execution.

The Political Bureau of the Central Committee of the Communist Party of the Soviet Union is the supreme policy-making body for economics as well as all other aspects of Soviet life (See Figure 1). The majority of its 15 voting and 7 consultative members are engineers by training; there is not an economist in the lot. The most junior member is 55; the ranking members are all 66 or older. By training and experience they are production oriented. During their rise to national prominence, the success criterion was quantity, not quality. Of late they have become increasingly aware of the need for higher quality and, in fact, have inaugurated a series of awards entitled "Up to World Standards." But judging by their performance, they dimly perceive such concepts as cost effectiveness, alternative choices, etc.

Burly, beetle-browed Leonid Ilyich Brezhnev, 66, chairs the weekly sessions of the Politburo where spokesmen for various groups thrash out solutions, large and small. For example, the Politburo lays down the guidelines of the annual and five-year plans which are then drafted by the government planning organization. The Politburo reviews these drafts and recommends their acceptance by the Party's Central Committee or "parliament" (see below), which, in turn, approves them. They are then formally ratified by the U.S.S.R. Supreme Soviet or government legislative arm, thereby giving them force of law for every form of Soviet activity.[10]

In addition to General Secretary Brezhnev, the Politburo membership includes the Party Secretaries for ideology, industry, and agriculture, the top government leaders, the Minister of Agriculture, and spokesmen for other key establishments. Decisions are believed to be reached usually on the basis of a concensus. Though no votes are ever published, there appears to have been some controversy over certain economic issues. The Party chief of the Ukraine, for example, publicly disagreed at the 24th Party Congress in 1971 with the geographic distribution of new investment when he argued for greater allocations for his republic's coal fields at the expense of investment in new energy sources in Siberia; he and his Belorussian counter-

[10] The only recent exception to this practice occurred when the U.S.S.R. Supreme Soviet failed to ratify the draft directives of the 8th Five-Year Plan (1966–70) issued by the 23rd CPSU Congress—perhaps because of embarrassment for they were issued almost two years after the plan allegedly had gone into effect.

part also bitterly attacked the emphasis on consumer goods contained in the Ninth Five-Year Plan.[11]

Politburo decisions are usually promulgated in the name of the Central Committee to which the Politburo is formally subordinated. The reverse is really the case. Membership in the 396-man Central Committee is formally bestowed by Party Congresses whose members are selected on the basis of a series of indirect elections in which the rank-and-file participate only at the first stage. Actually, membership in the Central Committee appears to go with the full-time position an individual holds. Jobs of this importance are on the *nomenklatura* or patronage list administered by the Politburo through its secretariat staff. The leadership is thus a self-perpetuating oligarchy from which one departs by age, ill health, or death, or in political disgrace, and one joins through co-option.[12]

If the Politburo is the national command center, then the Party apparatus headed by the Secretariat is the nervous system. Also chaired by Brezhnev, its 10-man membership includes three other voting members of the Politburo, three consultative members, and three junior secretaries. It, too, meets weekly to check on the execution of decisions and to draft reports for the Politburo, using its internal staff of several thousand Party officials. The Secretariat is organized as a functional duplicate of Soviet society; there are departments responsible for monitoring industry, agriculture, propaganda, education, and the armed forces and police. It is the channel through which decisions are passed down through the Party system for execution and verification in every administrative territorial division down to the basic Party organization formed in every institution, plant, or farm where there are at least three Party members. Each echelon in this system has its own smaller version of the Secretariat which controls and monitors activities within its own jurisdiction.

Though the Party formulates policy and oversees its execution, it directly administers little aside from propaganda agencies. The government furnishes the muscle which gets things done. It is organized on the European pattern with a Chief of State, 70-year old Nikolay Podgornyy, and a Head of Government, 69-year old Aleksey Kosygin. The former is largely a ceremonial office; the latter is a major one, for the encumbent chairs the 100-man USSR Council of Ministers which administers the entire economy (see Figure 2). It determines the output of all major commodities, investment, military production, consumer goods, foreign trade, housing construction, sets prices and wages, etc. In effect it owns and operates the productive plant and trade organizations and also is the sole stockholder in all financial institutions.

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[11] The Ukrainian Shelest lost his first Secretaryship during the Moscow Summit under circumstances which suggest he also might have opposed its convocation. The Belorussian Masherov, following the Summit, climbed aboard the Brezhnev bandwagon by bestowing upon him the lavish praise he appears to have studiously avoided earlier. Ironically, investment in the Siberian oil and gas fields is hoped to be obtained from U.S. and possibly Japanese sources. Also, with the shortfalls in 1972 economic performance, emphasis on consumerism has died down.

[12] On two occasions in recent years, however, the Central Committee may have played a more important role when the leadership was divided. The evidence, on the other hand, is far from conclusive. In 1957 and 1964 the Central Committee was convened to resolve disputes within the Politburo. The first led to the ouster of the "anti-Party group" of Malenkov, Kaganovich, Molotov, etc.; the second, to the removal of Khrushchev. No official accounts of these sessions have ever been published and the voting allegedly was unanimous, including those being ousted with the notable exception of the Old Bolshevik Molotov. Unfortunately, the number of Central Committee members voting is not known; neither is the number which constitutes a quorum.

The government functions at present in a highly centralized fashion, a reversal of Khrushchev's short-lived experiment with limited local control. There are ministries at the all-union, union republic, and republic levels. The all-union ministries are located in Moscow and directly supervise production facilities throughout the country; examples are the defense and aviation industries. Union-republic ministries have a central headquarters in Moscow and subordinate ministries in the republics; the central ministry directly controls major enterprises under its jurisdiction whereas the subordinate ministries administer the remainder. Typical union-republic ministries are agriculture and light industry. (Republic ministries usually handle industries of purely local significance.) The authorities are planning to transfer some functions from ministries to middle echelon management but even if this is effectively carried out, the system of economic administration will remain highly centralized in comparison with any Western country.

In this vast, cumbersome bureaucracy, battles rage on a scale which puts to shame the infighting found in the relatively miniscule governments in capitalist countries. Unlike Stalin who drove the Soviet Union into the coal and steel phase of the industrial revolution, and Khrushchev who perceived the advantages of the petro-chemical phase but too frequently saw problems in isolation from one another, the current leadership appears well aware of the inter-relationships between the many problems besetting the Soviet economy. In addition to the time-honored State Planning Commission which is supposed to be able to identify the needs of the economy and the sources necessary to meet those needs, and the State Committee for Material-Technical Supply which theoretically is able to ensure the availability of all requisite materials but more often than not is barely able to keep abreast of demand, the leadership has reorganized and beefed-up the State Committee for Science and Technology. It is the agency charged with developing and encouraging the adoption of new approaches by production agencies. It is the agency behind much of the drive to computerize the Soviet economy, to develop new management techniques to raise labor productivity which in industry, according to inflated Soviet statistics, they admit is only 54 per cent of that of the United States, and in agriculture, only 20–25 per cent.[13]

Meanwhile the leadership has continued the proclivity of its predecessors to tinker with the system of management. In 1965 they adopted a so-called economic reform which was mistakenly labelled in some Western publications as "creeping capitalism" because one of the success criteria was profits. Unfortunately, since the centrally set pricing system chronically lags far behind actual costs, managers began to produce what was profitable for their enterprise and slighted assortment which led to disproportions on a scale comparable to that which existed when weight or value were the prime determinants. As a result, ever more centralized controls have been reintroduced.

Similarly, for a while it appeared that management was going to be freed from the "petty-tutelage" or interference of non-technically competent Party authorities. Criticism of this was prominently featured in the year following the adoption of the reform but has gradually fallen off. More recently, examples of Party officials actively interfer-

[13] *Narodnoye khozyaystvo SSSR, 1922–1972* (Moscow, 1972), p. 64.

ing in—and supposedly solving—production problems is again being published.

The current panacea is the formation of self-financing "production associations", in effect medium-sized vertical or horizontal trust (in Western parlance), in place of numerous budget-funded enterprises. Under the reorganization decreed April 2, 1973, economic ministries will be limited to formulation of overall policy in planning, investment and much-needed technological improvement. Other ministerial functions will be transferred to the "production associations" which will not only control output in subordinate plants but also be responsible for research and development. The ministries are required to draw up reorganization plans within the next six months which, when approved by the government, will be implemented over the next three years.

Like so many previous reorganizations, one-shot gains are likely to be forthcoming, especially when already profitable activities are restructured; the efficacy of administrative reorganizations diminish over time and historical experience indicates that they have little positive effect when less-well endowed plants are brought into the new system. Undoubtedly in time this organizational innovation will also fall into disuse and other bureaucratic variants will be proffered in the apparently never-ending search for solutions which can be justified ideologically.

When Brezhnev and his colleagues took over from the ousted Khrushchev, they pledged to pursue "careful, scientific" policies. Compared to the blood and iron of Stalin's era and the plunging initiatives of Khrushchev's stewardship, they have fulfilled that pledge. But in so doing, they have created a gray bland image which has led some commentators to conclude that nothing significant has happened under their aegis and that they, personally, are "third raters." Both conclusions appear erroneous.

Brezhnev and Company have accomplished a good deal. One has only to recall their boldness and restraint in the Middle East, Westpolitik, and the detente with the West in foreign affairs. Domestically, it is true, they have been less innovative, but political dynamics, for example, have continued, as the recent demotion of Dmitry Polyanskiy has indicated. In fact, since their assumption of power in 1964, of the 28 men who have held or hold voting or consultative membership in the Politburo, only Party ideologue Suslov and Uzbek Party chief Rashidov function in the same capacity as they did then. Podgorny was removed from the Secretariat in 1965 and became Chief of State; Kosygin has slowly relinquished his role as principal negotiator with the West to Brezhnev; and Brezhnev has become clearly *primus inter pares*. The process, to be sure, has been incremental, but its cumulative effect has been to alter the specific gravity within the leadership. As for their mental capacity, few if any nations in history have raised their native geniuses to political leadership. Brezhnev and Company have, moreover, attained for their country the status of a superpower, at least militarily.

Attainment of superpower status militarily, however, has contributed to the inability of the Soviet Union to modernize its economy. Conceivably the process began at SALT I and now beginning at SALT II and the MBFR talks will contribute to a Politburo decision to alter its

priorities away from the military and toward the civilian sector. At the least it should give the Politburo pause before embarking on massive new military programs at the expense of the consumer. On the other hand, the Politburo track record to date suggests that its most likely course of action will be to attempt to muddle through. Perhaps the new Soviet Constitution Brezhnev promised for the 25th Party Congress in 1976 will reveal a government structure and philosophy which will make possible the attainment of the economic Nirvana so often promised the people. Odds are, however, that it will not.

The foregoing was written before the April 26–27 CPSU Central Committee Plenum which saw Brezhnev further consolidate his position and emerge with greater authority to pursue détente abroad while continuing his policy of tighter political and social controls at home. The plenum also made major changes in the composition of the Politburo by dropping Shelest and Voronov and elevating to full membership Ministers of Foreign Affairs Gromyko (64) and of Defense Grechko (69), and Chairman of the State Security Committee (KGB) Andropov (58), while naming to candidate membership Leningrad Party chief Romanov (50). These personnel changes appear to reflect the realities of power as they have developed over the past several years rather than to herald a realignment of priorities.

RECENT DEVELOPMENTS IN SOVIET PLANNING AND INCENTIVES

By GERTRUDE E. SCHROEDER

CONTENTS

I. INTRODUCTION

Under frequent prodding from an increasingly impatient political leadership to raise economic efficiency and solve some chronic problems, Soviet planners have introduced in the past few years numerous changes in the traditional methods of planning and in the system of incentives for enterprises. These changes stem from the so-called economic reforms announced by Premier Kosygin in September 1965.[1] In the ensuing 7 years the search for "improved" methods of planning has seemed frenetic, and changes in the formal rules governing enterprise incentives have followed one another in rapid succession. Since an extensive literature already exists on the early experience with the economic reform,[2] this paper focuses on two recent developments: (1) the changes in planning methods and approaches that affected the preparation of the Ninth Five-Year Plan and are slated to affect future plans and (2) the changes in incentive arrangements introduced in connection with the current five-year plan. Although the discussion refers mainly to the particulars of the industrial sector, much of it has relevance for the economy in general.

[1] *Pravda*, September 28, 1965.

[2] The most recent account of the experience with the economic reform during 1966–70 is given in Gertrude E. Schroeder. "Soviet Economic Reforms at an Impasse." *Problems of Communism*, July–August 1971, pp. 36–46.

As background for assessing the most recent developments, it is instructive to review the general philosophy that seemed to underlie the Kosygin reforms at the outset and to consider their specific objectives. As originally announced, the reforms involved the idea that some relaxation of rigid central planning and management of enterprises would be good for the economy. Fewer targets would be handed down to enterprises, whose freedom of action was broadened by statute, notably in the areas of the management of labor and investment. Economic "levers"—sales, prices, profits, a capital charge and enterprise incentive funds—were to predominate over administrative methods in orienting enterprises to produce saleable products at minimum cost. Thus, sales, profits and return on capital (profitability) replaced gross value of output as success criteria and the basis for bonuses. Enterprises were given their own incentive and investment funds to manage as they pleased. Some "spontaneity" thus would be engendered in the economy. Reacting spontaneously to these levers, enterprises would cease to "produce for the warehouse", skimp on product quality, conceal real production possibilities, ignore costs, resist innovation, "storm" and waste capital. Fewer detailed controls would be needed, and a long list of chronic economic ills would be eliminated, or at least ameliorated.

In the course of implementing the reform during 1966–70, an element of spontaneity did indeed develop. Enterprises allowed to operate under the new procedures started to exercise their new freedoms and to respond to the new economic parameters. Economic levers began to take hold, and in many cases things started to happen. But the planners did not always like the results. At the same time, the newly created bureaucracies continued to exercise petty tutelage over enterprises in the traditional ways, in violation of the rules of the reform and the new statutory rights granted to enterprises. To cope with these "problems", i.e., undesired, spontaneous enterprise actions, the planners successively amended the rules of the reform to restrict enterprise managers' leeway for action. The economic "levers" were administered in ever greater detail, and the size of the administrative bureaucracy steadily increased. Spokesmen for the reform began describing it as a long process, involving two phases: an "extensive" phase essentially comprising the years 1966–70, during which most industrial enterprise were gradually shifted to the new system, and an "intensive" phase during which the reform would be "deepened", and its real potentials would be realized. As the Soviet press made abundantly clear, the first phase witnessed little, if any, progress toward removing the chronic malfunctioning of the industrial sector. Industrial growth did not increase, and factor productivity improved only moderately over 1961–65.[3] At the beginning of 1971 the new system encompassed 83 percent of all industrial enterprises, most of transport and communications and substantial numbers of enterprises in other sectors.

The Ninth Five-Year Plan included, for the first time, a major section on planning and management.[4] The Plan states that the reform is to be extended throughout the economy by 1975. It specifies a number of ways in which planning and incentives are to be "improved" over

[3] James H. Noren and F. Douglas Whitehouse, "Soviet Industry in the 1971–75 Plan", pp. 206–245.

[4] *Pravda*, April 11, 1971.

the course of the Plan. Some of these approaches were reflected in the Plan itself, and others were on-going developments given emphasis by the Plan. All of them are aimed at raising economic efficiency in general, and solving persistent problems of the system that bear especially on consumer welfare and technological progress.

II. Modifications in Planning Approaches and Techniques

In addition to reorganizations of the administrative bureaucracy, Soviet planners typically have seen the solutions to malfunctionings of the economy to lie in "improving planning". Bad performance can be traced to bad plans; good plans, therefore, will result in good performance, provided only that enterprise managers' incentives are tied to fulfilling these good plans. In this vein, the "extensive" phase of the reform witnessed a wide-ranging search for planning approaches that would produce these elusive, "optimal" plans. The resulting approaches, emphases and methodologies affected the preparation of the Ninth Five-Year Plan for 1971–75, now in mid-course and behind schedule; they are also now slated to influence future plans. The principal developments in planning since 1965 will be considered under four themes: (1) the larger role assigned to five-year and longer range plans; (2) the efforts to devise more "scientific" plans, of whatever kind and duration; (3) the attempt to plan in much more detail technological progress, improved product quality, and economic efficiency; and (4) the use of mathematical models and computers, including input/output techniques.

A. The Larger Role of Five-Year and Long-Range Plans

In his original speech announcing the reforms, Premier Kosygin noted that contemporary developments in science and technology require that enterprise guidance have a time-horizon longer than is provided by annual plans. "Proper importance has not been attached to long-range plans," he said.[5] He called for "as a basic form of planning, a five-year plan with breakdowns of the more important assignments by years". The recommendations of the All-Union Conference on Improving Planning and Economic Management, held in May 1968, included this proposal, along with the stricture that the five-year plans be worked out within the framework of a system of long-range plans.[6] The emphasis on long-range plans was reinforced in the Party-government decree on science and technology adopted in October 1968; the decree instructed the Gosplan, the State Committee for Science and Technology and other agencies concerned to work out 10–15 year forecasts of scientific and technical developments to be used in planning.[7] Speaking at the 24th Party Congress in the Spring of 1971, both Brezhnev and Kosygin stressed the importance of long-range plans.

The Ninth Five-Year Plan embodies the approach called for by Kosygin in 1965. It includes, for the first time in Soviet planning experience, specific detailed targets for individual years in the plan

[5] *Pravda*, September 28, 1965.
[6] *Planovoe khoziaistvo*, No. 8, 1968, pp. 72–79.
[7] *Pravda*, October 23, 1968.

period. Also, this Plan was published, the first time such detail has been given for a five-year plan since the 1930's.[8] Moreover, in contrast to past plans, the Plan for 1971–75 was formally enacted into law by the Supreme Soviet, thus giving it directive force.[9] Responsible agencies were instructed to ensure that a five-year plan was worked out for each individual enterprise. In anticipation of this task, Gosplan had published lengthy instructions to industrial enterprises for drafting these plans.[10] Judging from these instructions, it appears that enterprise five-year plans are supposed to be worked out with annual breakdowns in a level of detail corresponding to that of a typical annual plan. The enterprise five-year plan contains 11 basic parts, the key indices for which are set by superior organs as sub-components of the aggregates in the national plan. If "life dictates," however, the plans for individual years within the quinquennium may be changed; indeed, numerous changes already were made in the plan for 1973, in response to the poor performance in agriculture and in the completion of new capacities during 1971–72.

In accord with a frequently cited Leninist dictum that "one cannot work without a plan designed for the long run",[11] Soviet planners have been doing preparatory work on the formulation of several sub-plans for 1976–80 and on a 15-year plan for 1976–90. In late 1971 the Collegium of the USSR Gosplan approved a "General Plan for the Development of USSR Power Systems to 1980", which is mandatory for use by subordinate Gosplans in formulating annual and five-year plans in that period.[12] Gosplan also has set up a number of special task forces to do the preparatory work for drafting the various major sections of the long-range plan. Based on the work of these task forces, Gosplan, together with the State Committee on Science and Technology and the USSR Academy of Sciences, has adopted a decree establishing a list of the most important problems to be considered and the kinds of scientific and technical forecasts and economic projections required for developing the plan for 1976–90.[13] The objective is, evidently, to provide the basis for simultaneous preparation of a 15-year plan with five-year breakdowns and the Tenth Five-Year Plan for 1976–80.

B. Providing a More "Scientific" Basis for Plans: The Role of Forecasts

In connection with the genesis of the 1965 economic reform proposals, Soviet planners became convinced that the key to improved economic performance lay in developing much more "scientific" bases and methodologies for centralized planning. The call for more "scientifically-based" plans involved two major ideas. First, long-term forecasts of scientific and technological developments should be made in some detail, and second, all parts of the plan should be based on projections (forecasts) of economic and social variables made with the use of modern mathematical and economic models. The planners perceived that the Soviet economy was not participating in the on-

[8] N. K. Baibakov (ed.), *Gosudarstrenniy piatileniy plan razvitia narodnogo khoziaistva SSSR na 1971–1975 godakh*, Moscow, 1972.
[9] *Pravda*, November 27, 1971.
[10] *Ekonomicheskaia gazeta*, No. 5, 1971, pp. 11–14, *Ibid.* No. 7, 1971, pp. 11–14.
[11] V. I. Lenin. *Polnoe sobranie sochineniy*, vol. 42, pp. 153–154.
[12] *Planovoe khoziaistvo*, No. 12, 1971, p. 88.
[13] *Ibid.*, No. 10, 1972, p. 151–152.

going, world technological revolution and evidently believed that if accurate forecasts of technology were made, the plans could take them into account, and the USSR's track record in this area would be improved. The current forecasting craze that has resulted apparently had its genesis in a speech that Premier Kosygin made to Gosplan officials in 1965. Stressing the importance of scientific and technical progress, he said, "Can we, in projections of the national economy, ignore substantiated forecasts relating to the future? No, we cannot." [14] Forecasting was institutionalized by providing as part of the Eighth Five-Year Plan a "State Plan for Highly Important Scientific Research" that included a comprehensive plan for working out socio-economic forecasts and forecasts of technological developments for 1971–75 and beyond.[15] Dozens of institutes launched forecasting programs, the effort being greatly facilitated by the increasing availability of more and better computers. In December 1966, the first Scientific Conference on Economic Forecasting was held under the auspices of Gosplan and the Academy of Sciences.[16] The high-level, active support for forecasting also touched off a lively, theoretical debate over the role of such forecasts in Socialist planning; this subject was sensitive, since it revived methodological-ideological issues in planning that had lain dormant since the 1920's.[17] The pragmatists have overcome the ideological scruples with the dictum "A plan without a forecast is just as impossible under Socialism as a forecast without a plan." [18] They take pains to emphasize, however, that forecasting is a part of pre-plan work. First, the past is analyzed, and forecasts are made of likely developments in science and technology and likely trends and relationships of socio-economic variables then with this information the specific social aims and purposes are selected for the plan period by the political leadership; finally an "efficient" plan for achieving these goals is formulated.

With the added impetus provided by the 1968 Party-government decree on scientific research, the forecasting effort has burgeoned. Everyone and his research institute have gotten into the act. The numerous scientific research institutes under the USSR Academy of Science and the economic ministries were charged with forecasting developments in science and technology. Economic research institutes took on the task of forecasting a variety of social and economic variables. An Economic Forecasting Section was created in the Institute of Economics of the Academy of Sciences and in Gosplan's Economic Research Institute, and 56 temporary commissions were set up to make various kinds of forecasts.[19] In April 1970 a Conference on Economic Planning and Forecasting Methodology was held under the aegis of Gosplan's Economic Research Institute.[20] Another conference was held on the same subject in 1971,[21] and a conference on forecasting prices was held in 1972.[22] As forecasting became the thing to do, complaints

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[14] *Ibid*, No. 4, 1965, p. 4.
[15] *Literaturnaia gazeta*, No. 1, 1971, p. 11.
[16] *Voprosy ekonomiki*, No. 3, 1967, pp. 149–152.
[17] See, for example, *Ibid*, No. 3, 1968, pp. 24–34. *Izvestia Akademii Nauk, seria ekonomicheskaia*, No. 5, 1970, pp. 5–15.
[18] *Ibid*, p. 7.
[19] *Pravda Ukrainy*, September 15, 1970.
[20] *Voprosy ekonomiki*, No. 7, 1970, pp. 150–153. *Ekonomika i matematicheskie metody*, No. 4, 1970, pp. 631–638.
[21] *Voprosy ekonomiki*, No. 9, 1971, pp. 154–157.
[22] *Ibid.*, No. 5, 1972, pp. 149–152.

were voiced about lack of coordination, overlap and duplication of effort, inconsistent and incompatible methodologies, and use of different basic assumptions.[23] Indeed, the 1970 Conference on forecasting had noted these phenomena and recommended that a national center be established to oversee a unified forecasting effort and to allocate tasks.[24] There should be developed (1) a list of required forecasts and indicators to be projected, (2) a single system of forecasting models to be worked out on computers, and (3) a standard set of reliable statistics. The pleas for a coordinator for the disparate forecasting effort produced an awe-inspiring decree issued in late 1972 under the imprimatur of Gosplan, the State Committee for Science and Technology and the USSR Academy of Sciences.[25] This document, an appendage to the already approved plan for research in the natural and social sciences in 1971–75, parcels out forecasting assignments to the various research institutes in connection with the preparation of the new 15-year plan and its sub-plans. But the decree does much more than make research assignments, for it is accompanied by an equally awe-inspiring decree with the impressive title "Main Methodological Principles and Mandatory Requirements for the Compilation of Scientific and Technical Forecasts."[26] It aims to cover all kinds of forecasts—both technological and social. This very epitome of a bureaucratic document defies adequate summarizing. Perhaps a bit of its flavor can be had from the following sketch. Each separate forecast: (1) must contain both technical indicators and indicators of the economic effectiveness of various ways "to implement domestic and world achievements" in the field involved; (2) should include an evaluation of the "social consequences" of each forecast development; (3) should include an analysis of relevant past and present developments in the USSR and the world and a prediction of developments in the period concerned; and (4) must be submitted to five separate agencies, with mandatory coverage of a large number of specified items. How the recipients will manage the mountain of paper that will surely result from this massive forecasting project is an interesting question.

Precisely what influence the forecasting work of research institutes had on the final draft of the Ninth Five-Year Plan cannot be determined by anyone outside Gosplan. On the one hand, Gosplan Chairman Baibakov states in a preface to the published plan that such research played a "significant" role.[27] On the other hand, the head of Gosplan's Economic Research Institute stated at the beginning of 1971 that "forecasts are still little used in planning and managing the national economy."[28] Although price forecasts were made for branches of industry and groups of commodities, the projections were not used in the plan.[29] It is clear, however, that, largely because of the availability of computers, many more computations and disaggregations were made for this plan than for previous ones. Thus, for the first time in planning history balances were worked out for 5500 different kinds of equipment in natural units and in value.[30] Material balances with

[23] *Izvestia Akademii Nauk, seria ekonomicheskaia,* No. 3, 1971, p. 139. *Pravda,* January 6, 1971.
[24] *Ekonomika i matematicheskie metody,* No. 4, 1970, pp. 631–638.
[25] *Planovoe khoziaistvo,* No. 10, 1972, pp. 151–152.
[26] *Ibid.,* pp. 152–155.
[27] N. J. Baibakov, *op. cit.,* p. 12.
[28] *Literaturnaia gazeta,* No. 1, 1971, p. 11.
[29] *Planovoe khoziaistvo,* No. 9, 1972, p. 56.
[30] *Ibid.,* No. 4, 1972, p. 128.

annual breakdowns were computed for 235 basic products, and investment requirements for materials were determined on the basis of technical norms, thus dispensing with the specific ministerial order documents that used to be required.[31]

Probably the most influential of the "scientific" forecasts were projections of a variety of technical indicators (norms) of projected savings in resources per unit of product. As shown in another paper in this volume, the norms for savings in materials were very bullish, especially those that underlay the plan for machinery and the plans for introduction of new capacities.[32] Goals for labor productivity and for completion of new capacities also are very ambitious. Soviet planners seem to have been carried away in particular by the results that could be achieved, on paper, at least, through reduction of material expenditures per unit of product. In his report to the 24th Party Congress Premier Kosygin called such reduction "an enormous reserve" in the economy.[33] The Soviet press frequently cited calculations of savings that could be achieved. For example, planners calculated that a reduction of 1 percent in use of ferrous metals in machinery production is equivalent to 260,000 tons of rolled metal, enough to make 100,000 T–74 excavators and over 60,000 SK–4 grain combines.[34] Gosplan's Scientific Research Institute for Planning and Norms prepared methodological materials to guide the ministries in recomputing norms and, based on ministerial submissions, worked out final proposals for reduction in materials expenditure norms during 1971–75 that were "used by Gosplan" in drafting the Plan.[35] It is clear that planning norms of all kinds were calculated and recalculated in a level of detail much greater than heretofore. Although expenditure norms have been developed for only about 70 percent of all industrial materials, work is underway to expand the list.[36] Moreover, as a recent book on planning points out, "Planning norms must be higher than the average attained and near to those attained by the best enterprises."[37] Finally, the planned reductions in material expenditures during 1971–75 were handed down to ministries and to enterprises as mandatory indices in their plans.[38]

Gosplan clearly was under strong pressure to make the plan for 1971–75 as taut as possible. In a rare description of the formulation process a Deputy Chief of Gosplan stated, "On several occasions the CPSU Central Committee and the Council of Ministers reviewed the basic problems involved in the draft Five-year Plan and directed attention of Gosplan, the ministries and the union-republics to increasing the role of efficiency in the economy and finding additional resources for strengthening agriculture and raising living standards."[39] From his description, it appears that Gosplan at several points in the drafting process tightened up plans submitted from below. In preparing the taut plan demanded by the leadership, Gosplan could defend its realism by reference to the "scientific basis" for its underpinnings—the projected gains in efficiency. As indicated, this Plan,

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[31] N. I. Baibakov, *op. cit.*, pp. 13–14.
[32] James H. Noren and F. Douglas Whitehouse, "Soviet Industry in the 1971–75 Plan", pp. 206–245.
[33] *Pravda*, April 11, 1971.
[34] *Material'no-tekhnicheskoe snabzhenie*, No. 7, 1971, p. 19.
[35] *Planovoe khoziaistvo*, No. 3, 1971, pp. 90–91.
[36] *Material'no-tekhnicheskoe snabzhenie*, No. 7, 1971, p. 17.
[37] M. P. Chistiakov and P. T. Morozov, *Planirovanie v. SSSR*, Moscow, 1971, p. 71.
[38] *Ekonomicheskaia gazeta*, No. 5, 1971, p. 12.
[39] *Planovoe khoziaistvo*, No. 5, 1971, p. 52.

more than its predecessors, was formulated using detailed forecasts of technical possibilities for resource savings that were worked out by engineers in the numerous industrial and scientific research institutes. Such people well might forecast as generally achievable efficiency gains that were technically possible with existing know-how and that may, indeed have been realized in some plants. Under great pressure to "uncover hidden reserves" in the economy, Gosplan could only welcome such "scientifically substantiated" forecasts. Could it be that attempts to "improve" planning by making it more "scientifically-based" may render it more unrealistic instead?

C. Planning Technological Progress

A principal concern of planners and economists in the past few years has been the search for ways to boost the rate of technological progress within a framework of socialist central planning. This search has involved, first of all, the attempt to devise satisfactory measures of the rate of progress, frequently considered to mean the efficiency of resource use in general. A second facet is the effort to devise specific technical parameters for planning and achieving particular aspects of technological progress.

1. MEASURES OF EFFICIENCY

Mindful of Kosygin's criticism in 1965; "It must be said that our economic scholars have not busied themselves greatly with analysis of the effectiveness of social production and the elaboration of proposals for increasing it," [40] economists have filled the economic press with discussions of how best to measure economic efficiency at various levels—economy, ministry and enterprise. One objective of the discussion was to devise a set of specific indices of efficiency that could be included in plans and that could serve both to force greater efficiency on producing units and to measure and compare the results achieved. The vigorous debates on the issue, still continuing, culminated in the publication by Gosplan in early 1972 of a draft set of "uniform and inter-related indices" for measuring the efficiency of economic activity.[41] For the economy as a whole and the republics the indices are: national income and consumption per capita, national income per ruble of capital invested, and per ruble of wages. For ministries, associations and enterprises a long list of indicators is provided. Essentially, they amount to calculating ratios of both net output and gross output per ruble of capital, labor and materials expenditures, along with a number of subsidiary indices. The draft list of indicators has been sent to ministries and some large enterprises, with instructions to compute the indicated measures for the period 1971–75. Presumably, the next step will be to incorporate the finally agreed upon set of indices into the formal plan documents and to make fulfillment of the plans for some or all of them mandatory. These steps have already been taken with respect to two of the indicators, profitability and labor productivity.

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[40] *Pravda*, September 28, 1965.
[41] *Ekonomicheskaia gazeta*, No. 34, 1972, p. 10.

According to Gosplan Chief Baibakov, a wide variety of indicators of efficiency in the use of capital, labor and material resources were used in preparing the Ninth Five-Year Plan—many more than in previous plans.[42]

An important recently adopted document is a "Standard Methodology for Calculating the Efficiency of Capital Investment", published in 1969.[43] Because the new Methodology represents a revision of an earlier (1959) Methodology [44] to which Western specialists on the Soviet economy have paid considerable attention, it is worthy of extended treatment. Unlike the earlier document, the new Methodology was formally approved by Gosplan, the State Committee on Construction (Gosstroy) and the Presidium of the Academy of Sciences and is described as "mandatory" for all sectors of the economy. On its basis the ministries are to work out specific branch methodologies. The revised General Methodology is at once broader and more explicit than its predecessor. The revision was intended basically to serve two purposes: (1) to establish a uniform definitional and methodological basis for calculating the efficiency of investment throughout the economy and at key administrative levels, and (2) to bring this facet of planning in line with the concepts and terminology of the on-going economic reform. Both purposes are in furtherance of the greatly increased emphasis of the current leadership on the critical importance of raising the return on investment, following its dramatic, sharp decline during Khrushchev's latter years.

The new Methodology represents an advance over its predecessor in the direction of greater economic rationality. What its actual impact will be in practice is another question. The principal differences between the old and the new Methodologies are the following:

(1) Unlike its predecessor the new Methodology specifies formulae for calculating the overall efficiency of capital investment termed "coefficients of absolute effectiveness." For the whole economy, the republics and the major sectors, this measure is the incremental output/capital ratio, with output defined as national income (Soviet concept). For sectoral sub-branches and for ministries and their subordinate organizations the measure is the incremental profits/capital ratio. The first formula includes the proviso that the ratio is to be calculated "under a given output structure", a phrase whose intent is obscure, perhaps deliberately so.

(2) Like its predecessor the new Methodology provides a formula for the so-called "Coefficient of Relative Effectiveness" or CRE. This measure is supposed to be used in choosing between two technical solutions for a given problem such as the location of new enterprises. Although the conceptual basis is the same, the revised Methodology provides a different formula for calculation, namely: $C_1+E_aK_1=$ Minimum, where C is the current operating cost for each variant, E_a is the Standard CRE, and K is the capital investment for each variant. The reciprocal of this formulation is the recoupment period.

(3) Unlike its predecessor, the new Methodology fixes a Standard CRE of 0.12 and a standard discount rate of 0.08, the latter to be used

[42] N. I. Baibakov, *op. cit.*, p. 13.
[43] *Ekonomicheskaia gazeta*, No. 39, 1969, pp. 11–12.
[44] *Planovoe khoziaistvo*, No. 3, 1960, pp. 56–62.

in calculations involving streams of investments and costs over different time periods. With the approval of Gosplan, the ministries may set lower CRE's for their sub-branches "when necessary to stimulate technological progress and to take account of dissimilar wage levels (zonal and branch), differences in price levels, the lengths of construction programs and regional differences."

(4) The new Methodology provides more guidance than did the old one on the kinds of items to be taken into account in the various computations, and it also allows for lags.

The revised Methodology has occasioned much comment in the economic press.[45] From this discussion it is evident that many ambiguities exist in the document, particularly over the precise uses to which the two coefficients (absolute and relative) are to be put. While the document specifies the standard CRE in the section that discusses the choice between technical variants, the press comment suggests that it is being regarded as a guideline for the minimum return on investment in general.[46] The figure itself apparently was derived as the actual average return (profits/capital) on investment in the economy as a whole in 1967–68. The establishment of a standard CRE culminated a decade or more of academic debate over whether a uniform or differentiated coefficients should be fixed. The provision of a clause in the new Methodology allowing for deviation below the standard CRE has produced cries of outrage from the advocates of uniformity. Federenko, for example, says that the escape clause "in essence opens the door to the greatest arbitrariness in calculating the efficiency of project variants and reduces the scientific significance of the Methodology to naught."[47] The branch methodologies thus far adopted do indeed allow for considerable deviation. While the distress of economists like Federenko is understandable, deviations probably are essential in practice, and perhaps even "rational", given the arbitrariness of Soviet prices.

2. TECHNICAL PARAMETERS

On a less aggregated level, the planners have been trying to devise specific technical parameters for inclusion in plans, in order to force various aspects of technological advance in a narrower sense. The plans have long included targets for the number of new machines and new products to be produced. The current effort is focused on the upgrading of product quality and concerns not only the inclusion of more indicators in plans, but also measures to enforce them. In 1965, Kosygin said, "It is necessary to provide in the plans for the most important indices of the technical level and quality of output. . . . It

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[45] *Ibid.* No. 10, 1969, pp. 34–44; No. 7, 1970, pp. 68–78. *Voprosy ekonomiki*, No. 11, 1970, pp. 126–135; No. 12, 1971, pp. 3–15. *Ekonomika i matematicheskie metody*, No. 2, 1971, pp. 165–171. V. P. Plyshevskiy, *Effektivnost' kapitalnykh vlozheniy*, Moscow, 1972, pp. 8–18.

[46] To avoid misunderstanding on this point, it should be said that specification of standard calculation rules and a standard CRE does not mean that inter-sectoral, inter-industry or enterprise investment allocations are actually being made on the basis of relative rates of return or even that planners believe that they should be. Both average and marginal rates of return differ widely among sectors and branches and enterprise profitability varies enormously for reasons that have little to do with relative efficiency. As allocations in the Ninth Five-Year Plan indicate, investment continues to be allotted mainly on the basis of political policy rather than on economic calculation. For a somewhat different interpretation of the purposes and uses of the new Methodology, see Alan Abouchar, "The New Soviet Standard Methodology for Investment Allocation", *Soviet Studies*, January 1973, pp. 402–410.

[47] *Ekonomika i matematicheskie metody*, No. 2, 1971, p. 167.

is necessary to raise the role of the State standards as an effective means of improving the quality of output. State certificates of the quality of output should be introduced." [48] Besides a voluminous press discussion on these topics a number of government actions have been taken to implement these facets of the economic reform. The Standard Methodology for formulating enterprise five-year plans includes "indicators of the quality of output" in the list of targets that are set by higher-level organs.[49] An elaborate procedure has been worked out for specifying these plan indicators. The government has instructed the ministries, beginning in 1972, to classify all of their products into three categories—"highest", or those that meet the best domestic and foreign achievements, "first", or those of lower quality but which are in demand, and "second", or those that are of inferior quality or obsolete and whose production should be phased out.[50] A standard procedure for such quality certification has been published under the imprimatur of Gosplan and several other agencies.[51] Enterprise plans are to include centrally set percentages of total output that is to comprise products of the highest category; targets for raising this share are to be established, and the products involved are to be included in the plant's obligatory nomenclature list in physical units.[52]

Another approach concerns a highly-publicized program to award a "State Seal of Quality" to superior products, particularly consumer goods.[53] The Ninth Five-year Plan includes the goal of raising the number of products with the Seal from 4,000 to about 15,000.[54] Despite a vigorous press campaign pushing the program, the amount of red-tape involved has been a considerable deterrent to progress. Moreover, it was reported in late 1972 that of the 1900 items produced in the Ministry of Light Industry that have been awarded the Seal of Quality, only 1200 are actually being produced; for clothing only 347 of the 821 products certified are being produced.[55] Still another approach is a vigorous effort to establish and upgrade State standards. Although standards have long been a feature of Soviet industrial practice, their use is being greatly expanded, as vehicles for promoting technological progress. The State Committee on Standards, elevated in status in 1970, is in charge of this program. In 1969 its research institute published a "Standard Methodology for Determining the Effectiveness of Standards",[56] and the importance of standards in the technical sections of the plans has evidently been raised considerably. A Party-government Decree of December 5, 1970, ordered a review and updating of all standards during 1971–75 and instructed Gosplan and the Ministries to include in enterprise plans beginning in 1972 specific assignments for raising the level of product standardization, particularly in machinery production.[57] The Standards Committee was to issue in 1971–72 a series of uniform procedures relating to technical upgrading of output, *viz.*, procedures for "the confirmation of technical assignments, for the conduct of expert examination of designs, for

[48] *Pravda*, September 28, 1965.
[49] *Ekonomicheskaia gazeta*, No. 5, 1971, p. 12.
[50] *Voprosy ekonomiki*, No. 4, 1972, p. 48.
[51] *Ekonomicheskaia gazeta*, No. 41, 1972, p. 8.
[52] *Sotsialisticheskiy trud*, No. 9, 1971, p. 152.
[53] *Ekonomicheskaia gazeta*, No. 42, 1969, pp. Insert 1–8.
[54] N. I. Balbakov, *op. cit.*, p. 83.
[55] *Pravda*, November 10, 1972.
[56] *Standarty i kachestvo*, No. 8, 1969, pp. 5–8.
[57] *Izvestia*, December 5, 1970.

testing of experimental models, for the issuance of permits for putting new types of output into production, and the conduct of control tests of series output." The bureaucracy leaves nothing to chance! The Decree gives the Standards Committee powers of inspection and checking up on observance of standards. If enterprises sell products that deviate from state standards or technical specifications, such sales are not counted for purposes of plan fulfillment, and the attendant profits must be paid into the state budget. Finally, on a note of desperation, the Decree states, "The USSR Ministry of Justice, in conjunction with the USSR Prosecutor's Office and the USSR Supreme Court, has been charged with studying and generalizing the practice of the application of legislation on responsibility for the production of poor-quality, nonstandard and incomplete output and with elaborating measures for increasing the effectiveness with which this legislation is applied, so that officials who permit the systematic production of poor-quality output do not go unpunished." In furtherance of this mass assault on the intractable problem of product quality the State Standards Committee is drafting a mammoth set of procedural regulations for a uniform system of quality control for all industry,[58] parts of which are to be introduced during 1971–75. In the meantime, in the real world, as opposed to the papercreating bureaucratic world, the beleaguered ministries are already behind schedule on standardization tasks,[59] and quality problems are rife.

D. Role of Mathematical Models and Computers in Planning

After some withering away of ideological shackles, Soviet economists have turned their attention to the use of mathematical models for economic analysis and prescriptions for plans. Also, with the increased availability of computers of sizeable capacity Soviet planners have begun to fit them into the planning routine. It is also evident that some persons in high places, some economists and some planners view these models and machines as a great "reserve" for raising efficiency in the economy, while preserving both central planning and central administration. Despite some initial foot-dragging, the planning bureaucracy has now accepted, and even embraced the new techniques. Like the economic reform, which has already been successfully assimilated and bureaucratized into impotence,[60] the planners now seem to have discovered that planning for the use of mathematical models provides an enormous scope for bureaucratic activity. The amount of such computer-related activity has burgeoned in the past several years, and the amount already set en train is awesome to behold. The aim of this section is to try to reduce this enormously complex subject to intelligible proportions. It will (1) outline the highlights of the drive for computerization of planning and management since 1965; (2) describe two key computer-managed planning systems that have been launched—ASPR and ASN; and (3) assess the present state of the use of input/output, or I/O in actual planning practice. The focus throughout will be on what the government agencies have done or are actually doing. Thus, we abstract from

[58] *Standarty i kachestvo*, No. 8, 1971, pp. 25–28.
[59] *Pravda*, March 3, 1972.
[60] For a defense of this thesis see Gertrude E. Schroeder, "Soviet Economic Reforms at An Impasse", *Problems of Communism*, July–August 1971, pp. 36–46.

the comprehensive, cybernetic models of an "optimally functioning socialist economy" that some academic economists are writing about.[61] What the planning bureaucracy has launched, however, is also labelled as steps toward a system of optimal planning and administration. It will help the reader to keep reminding himself that none of the projects described below is actually operational. They are preliminary plans for systems or plans for planning systems, or systems analysis of current planning with a view to planning new systems.

1. THE DRIVE FOR COMPUTERIZATION OF PLANNING

The amount of information required and generated in a centrally-administered economy is enormous. Electronic data processing appeared to be the obvious answer to the Soviet statistical and planning problems. In the early 1960's, Soviet cyberneticists developed models for a nationwide system of computer centers for information collection, processing and use. At that time, the work on this project and the related mathematical models for economic management was coordinated by the Main Administration for the Introduction of Computers into the Economy under the State Committee for Coordination of Scientific Research.[62] In 1966, a government decree provided for establishing "a state network of computer centers for the collection and processing of information and the solution of problems of planning and control in the economy".[63] As then envisioned, the network was to be based on the existing facilities of the Central Statistical Administration. Sectoral and branch computer systems for "planning, accounting, control and information processing" also would be created subsequently, and their facilities would be connected with the state network. It appears that for several years a bureaucratic tug of war ensued between Gosplan and the Central Statistical Administration over which agency was to be in charge of this vast project. In the interim, both agencies acquired more computers and put them to work in their respective bailiwicks.[64] Gosplan had also created a Department for the Introduction of Economic-Mathematical Methods into Planning.[65]

Although little, if anything, was actually being accomplished, the idea of a statewide computer network continued to receive support—notably in the recommendations of the 1968 Conference on Improving Planning and in the Directives for the Ninth Five-Year Plan. A prestigious All-Union Conference on Using Computers in Economic Management was held in January 1972. The bureaucratic jurisdictional quarrel was settled, at least for the moment, when the task of coordinating plans for the network was given to the Institute for Problems of Organization and Management set up in late 1971 or early 1972 under the State Committee for Science and Technology. Its Director, D. G. Zhimerin, revealed the present embryonic status of this project, when he stated in mid-1972 that his institute had been entrusted with the task of developing the principles of organizing a "Statewide Automated System for Collecting and Processing Infor-

[61] These models are described in some detail in Michael Ellman, *Soviet Planning Today: Proposals for an Optimally Functioning Economic System*, Cambridge, 1971.
[62] *Voprosy ekonomiki*, No. 7, 1964, pp. 87–92.
[63] *Ekonomicheskaia gazeta*, No. 13, 1966, p. 25.
[64] *Planovoe khoziaistvo*, No. 7, 1968, p. 65.
[65] *Ibid*, No. 9, 1968, p. 55.

mation for Planning and Administration (OGAS)", and that as a part of this project the Institute is drawing up a plan for the location of a statewide network of computer centers and a general plan for the construction of a statewide data transmission system.[66] In addition to the computer network and the data transmission system, OGAS is conceived as having a number of key functional subsystems, which are in various initial stages of development. These are: an automated system of plan calculations (ASPR), an automated system of norms (ASN), an automated system of state statistics (ASGS), an automated system for managing supply (ASU MTS), an automated system of standards and metrology (AIUS), an automated system for processing price information (ASOI tsen) and an automated system for management of scientific-technical progress (ASUNT).[67] In addition to these nationwide subsystems, there are to be subordinate "line" automated system of management (ASU's) for republics and ministries (OASU's) and also for enterprises (ASUP's). The ultimate aim is to link the computers in all of these systems with one another, via the state data transmission system. Thus, a single, unified, automated system of management—"the state's unified cybernetic brain"—will be created for the entire economy.[68] This grandiose scheme is being taken very seriously by the Soviet government, generating voluminous press reporting, and a large amount of bureaucratic activity in the form of conferences and a flood of documents. To provide some notion of what is involved and what has already been done, we report below on the plans for one subsystem—ASPR—and its auxiliary subsystem—ASN.

2. ASPR AND ASN

The objective of ASPR is to provide an integrated, computerized and uniform system for working out national economic plans and monitoring their fulfillment. In its simplest aspect, it is initially a project to link all of the planning bodies—USSR Gosplan, the Gosplans in the republics, local Planning Departments, and planning departments in the ministries and their main administrations—with computers and with the mandatory use of a common set of information and procedures. In this least ambitious form, the system's successful introduction presumably would speed up plan calculation and the exchange of information in plan formulation and also would provide faster information feedback and exchange during plan implementation. ASPR would then represent essentially merely the mechanization of the existing planning system. Ultimately, ASPR may amount to no more than this, for even this limited task is an enormous undertaking. It appears that in late 1972 functioning computer centers were in operation only in the Gosplans of the Ukraine, Kazakhstan, Belorussia, Uzbekistan and Lithuania, while in the other republics "the effort to employ mathematical methods and computers in planning is just beginning." [69] Apparently, USSR Gosplan's Main Computer Center has not yet been linked operationally with any of these centers or with those in the ministries.

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[66] *Ekonomicheskaia gazeta*, No. 37, 1972, p. 5.
[67] *Ibid*, No. 50, 1971, p. 5.
[68] *Moskovskaia pravda*, August 12, 1972.
[69] *Voprosy ekonomiki*, No. 11, 1972, p. 29.

ASPR's auxiliary system, ASN, which would form a component part of a project merely to computerize the existing planning system, is intended to computerize the system of planning norms for labor, materials and financial expenditures that are a fundamental part of the present planning methodology.[70] Thus, ASN would transfer to computers the laborious task of storing, aggregating and updating the ubiquitous planning norms and would facilitate the calculation and use of such norms in much greater detail. The planning for this practical project seems to be well underway, with Gosplan's Research Institute for Planning and Norms having been designated to coordinate the work. A number of methodological documents for the system have been approved, and many more types of norms are already being calculated and used in planning. Creation of ASN may even have been accorded priority, given its intimate connection with current planning practices.

As described in the literature, however, ASPR is intended ultimately to be much more than a mere computerization of existing planning practices. It is suposed to represent an entirely new system of planning, "scientifically based", and making large use of consistent economic-mathematical models of all kinds and at all levels to calculate plan variants and to optimize planning decisions. It is supposed to be based on a unified and improved information system, the inputs into which are being separately developed in the other nationwide systems noted above.[71] In the words of a planner, "Thus, the quality of the plans for economic development will be substantially improved." [72] Academic mathematical economists view ASPR as a vital unit in the actual application in practice of their overall models for the "optimally functioning socialist economy." [73]

The first work toward the creation of ASPR was begun in Gosplan in November 1966.[74] A draft statement of the basic approaches to developing the system was formally approved in 1969 at a meeting of the various Gosplans and a unit of the Academy of Sciences. In 1970, a coordinator, Gosplan's Main Computer Center, was designated for the task, and in May 1972 a detailed coordination plan and a series of procedural documents were approved by Gosplan. Thus, the work of designing the projected system has been formally launched.

ASPR is supposed to consist of some 300 sectoral and support subsystems.[75] The sectoral components parallel the basic substantive parts of the national economic plan—summary balances, level of living of the population, labor, etc.—and the major geographic and economic sector breakdowns. The support components concern procedures; information; mathematical, technical and organization support; and personnel. Task forces have been set up to devise each of the subsystems. Present scheduling calls for the full introduction of the system in 1977, with five stages of implementation being envisioned as

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[70] *Ibid*, No. 9, 1971, p. 160. *Planovoe khoziaistvo*, No. 3, 1972, pp. 70–78. *Ibid*, No. 8, 1972, pp. 151–152.

[71] For example, the Automated Systems for State Statistics. (*Vestnik statistiki*, No. 12, 1972, pp. 28–35) and for prices (*Planovoe khoziaistvo*, No. 2, 1973, pp. 156–157.)

[72] *Ibid.*, No. 8, 1972, p. 17.

[73] *Ekonomicheskaia gazeta*, No. 23, 1972, p. 7. *Voprosy ekonomiki*, No. 6, 1972, p. 99. *Ibid.*, No. 7, 1971, pp. 19–20.

[74] *Planovoe khoziaistvo*, No. 7, 1972, pp. 157–158. *Ibid.*, No. 8, 1972, pp. 3–8.

[75] *Ibid.*, pp. 9–15.

follows: development of technical specifications—six months; preliminary designing—one year technical designing—one year: working designing—18 months; introduction—18 months. Apparently, the system is now being designed for the capabilities of the second generation, Minsk—32 computer, but is supposed to be modified, when more powerful ones become available. The problem of planning the coordination of all these task forces and their subsystem designs has yet to be faced.

3. USE OF INPUT/OUTPUT (I–O) TECHNIQUES IN PLANNING PRACTICE

The contrast between the planned future planning and the present procedures is extreme. While planning a comprehensive, integrated computer network drags on from year to year, the actual installation of computers throughout the economy proceeds haltingly and at random at various levels, including some enterprises. Problems of deficient hardware, inadequate software and insufficient trained programmers continue to plague the users. The owner of each computer procedes to program his machine to his problems as best he can, thus adapting the machines and programs not to the ASPR of the future, but to the present organization and procedures. This lag is most clearly seen in the use of input/output techniques.

Despite much writing about the use of mathematical models and extolling of their virtues, their advent seems not to have changed traditional planning practices in any significant way. Rather, these models, including I–O, appear to serve merely as adjuncts to the traditional approach. This seems to be the present situation, despite high-level political support for mathematical approaches to economic problem-solving and frequently expressed laments of academic model-builders that their models are not being used. Thus, Academician Federenko writes, ". . . I regret to say that so far the use of economic and mathematical models has not been of a consistently systematic nature and has served, as it were, as an extraneous addition to the economic planning and management system. However, to insert models directly into the planning process is impossible, for this very process is unadapted in terms of its methods, technology, organization and information base to systematic model use. These are the same reasons why electronic computers in national economic planning have also been used thus far basically for mechanizing separate, comparatively homogeneous calculations." [76] Another mathematical economist, S. S. Shatalin, states, "Hitherto, mathematical-economic models and computers have been used mainly for the solution of one-time only, individual plan tasks, often ones that are scarcely inter-connected. Calculations on the basis of models have been a sort of "extension" to the existing system of planning and control." [77] But, significantly, he continues, "One of the weakest points in the use of mathematical-economic models is the absence of the necessary statistical, technical and economic-planning information. This situation has inevitably made models over-simplified and crude, which has watered down the conclusions and results obtained from them." Both of these economists pin their hopes for change on the fundamentally new approach and information base that is supposed to be generated by OGAS and its component, ASPR.

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[76] *Ekonomicheskaia gazeta*, No. 23, 1972, p. 7.
[77] *Pravda*, July 19, 1972.

Soviet economists regard input/output models as the most developed of their planning models and potentially of great utility in improving the quality of plans. It seems useful, therefore, to try to discern from the literature the present state of affairs with respect to the actual use of I–O techniques in planning practice. Despite the compilation of two ex post I–O tables (for 1959 and 1966) and a considerable amount of work on developing planning I–O tables,[78] an economist could write in early 1968, "It would be no exaggeration to say that not a single important decision in current or long-range plans has been taken on the basis of construction of I–O balances either in physical units or in value form." [79] Probably, the same statement could be made by someone writing in 1973. The author of a descriptive book on Soviet planning published in 1971 merely states with respect to I–O, "At present, measures are being taken to speed up the introduction of I–O into planning practice." [80] Descriptions in the planning literature indicate clearly that the advent of I–O data has not altered traditional planning approaches in the least; rather, the availability of sets of I–O data and of computers has made possible the addition to the planning process of a large number of new kinds of calculations and a type of analytical work that was not possible before. It is also evident, however, that there is considerable political and academic pressure to use I–O techniques as a means for making the plans more "scientifically based" and that Gosplan is now carrying out a large amount of work in an attempt to build bridges between I–O and the traditional techniques.

What specific actions have been taken since 1965? First, the whole effort was given strong impetus by a Council of Ministers' Instruction requiring the use of the 1966, ex post I–O table in compiling the Ninth Five-Year Plan.[81] A chapter on the methodology to be used in calculating planning I–O tables was included for the first time in Gosplan's volume of Methodological Instructions for compiling the national economic plan, published in 1969.[82] Planning I–O balances were calculated for 1970 in physical and also in value form. As described in the methodology, these balances seem to be calculated by working backward from preliminary plan targets already developed in the usual way, namely, from: general overall policy goals, sets of planned coefficients for direct expenditures of materials, fuels and labor per unit of product and calculations of total sectoral outputs that are deemed to be in accord with planned availabilities of investment and labor. The resulting I–O tables are used to check on the consistency and feasibility of the preliminary set of plan targets.[83]

A commonly cited reason for the delay in using I–O in planning has been that the former is worked out as a commodity/commodity matrix, whereas material balances and plan indexes are worked out primarily on a branch of industry basis, with the results ultimately becoming mandatory plan targets addressed to economic ministries. Moreover, even for physical products the systems of product classifi-

[78] For a description of Soviet work on I–O see Vladimir G. Treml, Dimitri M. Gallik, Barry T. Kostinsky and Kurt W. Kruger, *The Structure of the Soviet Economy*, Durham, Duke University Press, 1972, pp. 11–32.
[79] *Voprosy ekonomiki*, No. 2, 1968, p. 20.
[80] M. P. Chistiakov and P. T. Morozov, *op. cit.*, p. 71.
[81] *Vestnik statistiki*, No. 11, 1968, p. 84.
[82] Gosplan USSR, *Metodicheskie ukazaniya k sostavleniy gosudarstvennogo plana razvitia narodnogo khoziaistva SSSR*, Moscow, 1969, pp. 574–609.
[83] *Ibid.* p. 576.

cation are not uniform. Gosplan economists apparently have perceived the problem of utilizing I–O as involving its adaptation to conform to traditional planning approaches. As early as 1968 it was recommended that Gosplan should draw all of its departments into the work of developing I–O in useable form.[84] Gosplan apparently has now begun to tackle this problem with vigor, using the basic approach of "connecting" I–O with plan indexes. A sub-department for I–O has been created in Gosplan's Department of Summary Balances. Extensive experimental work has been done by Gosplan's Economics Institute and its Main Computer Center, and a program has been underway to familiarize all Gosplan Departments with I–O work. This effort resulted in the preparation of a planning I–O table for each of the years 1971–75 in physical and value units and a consolidated table in value terms for the period as a whole.[85] It appears that the former is a 260-sector model and the latter an 18-sector model and that work on an 800-sector physical table is in process.[86] The annual planning tables for 1971–75 were worked out "in Gosplan terms", i.e., the list of products, industries and ministries included in the I–O tables correspond to those used in the national economic plan. The list included 257 products, 25 industrial ministries and 20 sectors of the economy. The basic information for calculating the I–O tables was obtained from the Gosplan departments for the various balances and for sectors of the economy. The data consisted of: calculations of gross output of industrial ministries and agriculture, requirements for basic kinds of industrial and agricultural products, material balances for basic products, and calculations of labor productivity and capital requirements by ministries and branches.[87]

Gosplan economists describe the development of these planning tables for 1971–75 as "a decisive step" in adopting I–O for application in planning practices.[88] With the use of the tables a number of analytical calculations were made in connection with preparation of the Ninth Five-Year Plan. They reportedly revealed, among other things, that some planned outputs (many kinds of machinery, chemicals and agricultural products) were not matched with demands, and that there were inconsistencies between physical and value indexes in some machinery branches. Information deficiencies of various kinds also came to light, including the interesting finding that various Gosplan departments were using different methodologies to calculate similar plan indexes.

In summary, I–O tables are now being used to (1) calculate plan variants; 15 variants were calculated using the planning I–O table for 1970;[89] (2) perform a variety of analyses relating to the feasibility and consistency of the plans; (3) ascertain detailed, structural interrelationships among sectors of the economy; (4) improve the planning norms used in calculating material balance; (5) provide full input coefficients, not previously obtainable, and; (6) forecast long-term developments, aggregated dynamic models being used for this purpose. Thus, it seems that the plan is being formulated in the traditional ways,

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[84] *Planovoe khoziaistvo*, No. 7, 1968, pp. 62–63.
[85] *Ibid.*, No. 2, 1972, pp. 64–68.
[86] *Voprosy ekonomiki*, No. 11, 1972, pp. 38–39.
[87] *Planovoe khoziaistvo*, No. 2, 1972, pp. 64–65.
[88] *Ibid.*, p. 65.
[89] B. F. Novichkov, *Material'nye balansy*, Moscow, 1972, p. 102.

but the new I–O adjunct is making useful contributions by providing analytical results and types of information not previously available to the planners.

Writers on the use of I–O and other types of models in planning agree that their present and potential usefulness is seriously limited by the lack of a sufficiently complete and reliable information base.[90] The same lament is made in regard to planning by the traditional method of balances. With respect to both, the complaint usually takes the form of assertions about the poor bases for calculating the innumerable, technical and value norms that are part and parcel of these methods. The creation of ASN is supposed to yield great improvements in this area. The quality of the present information basis for Soviet planning and for model-building by economists is described most graphically by S. S. Shatalin, who is Deputy Director of the Academy of Sciences' Central Economic-Mathematical Institute (TSEMI):

"Information is one of the biggest bottlenecks in the practical use of mathematical-economic methods in planning and management and in raising the scientific level of planning and management. At the present time, statistical and economic planning information is clearly insufficient, not sufficiently unified and of a poor time sequence. Internally coordinated information on expenditures of material, man-power and natural resources for the production of output is also insufficient and poorly systematized. Yet, whereas without the use of mathematical-economic models the defects in information in planning calculations do not result in shortcomings that are clearly visible in the plan (but are clearly felt in reality), for the developers of models, who have to convert their mathematical symbols into figures, they result literally in "natural calamities", to which unfortunately we are gradually becoming accustomed. This is one of the basic reasons for the conversion of mathematical-economic modeling into abstract academic exercises in the bad sense of this word." [91]

E. Other Approaches To Improving Planning

The chronic shortcomings in planning that were pointed out and severely criticized at the 24th Party Congress produced a *mea culpa* editorial in Gosplans house organ and vows to put matters right along the lines indicated in the Plan Directives.[92] Besides the specific measures being taken in areas noted above, Gosplan has launched two major efforts to solve the intractable and all-pervasive planning problems. Following complaints that planning was becoming fouled up by lack of uniformity in methodological approach, because subordinate agencies, institutes and ministries were ignoring Gosplan's published Methodological Instructions and issuing their own. Gosplan dispatched an order forbidding this practice and requiring Gosplan clearance for all planning instructions.[93] Subsequently, Gosplan launched a project to enlist all Gosplan departments and research institutes, along with the ministries and other agencies concerned, in developing proposals for revising the volume of official Methodological Instructions published in 1969. Specific drafting assignments were made, with a deadline of February 15, 1973 for submission of the final draft to the Gosplan leadership.[94] At the end of 1971, Gosplan launched still another project—this one to get ideas on how to improve planning and

[90] *Pravda*, July 19, 1972. *Planovoe khoziaistvo*, No. 2, 1972, p. 66. B. F. Novichkov, *op. cit.*, pp. 100–101.
[91] *Voprosy ekonomiki*, No. 7, 1971, pp. 19–20.
[92] *Planovoe khoziaistvo*, No. 5, 1971, pp. 2–13.
[93] *Ibid.*, No. 11, 1971, pp. 95–96.
[94] *Ibid.*, No. 3, 1972, pp. 157–158.

management in general. It set up a high-level Committee of Gosplan officials charged with the task of preparing recommendations on a specified list of problems.[95] In a subsequent order, issued in April 1972, Gosplan assigned its various departments specific responsibilities for preparing recommendations.[96] The Councils of Ministers in the republics and the economic ministries are also being required by government directive to submit recommendations. Gosplan's order appends a detailed list, consisting of eight major sections and 51 subsections, covering the areas on which proposals are to be submitted. Another mountain of paper will result from this project.

Meanwhile, academic ceonomists continue to criticize the present methods and approaches used by Gosplan in developing the plans. This critical literature has begun to advocate, among other things, the application of systems analysis to planning. One economist argues for example, that the present ministerial-branch approach should be replaced by systems of plans based on major sectors and all of their inputs, e.g., agriculture.[97] The implied allegations that Gosplan planning is not systematic produced a long article by Gosplan's Deputy Chairman, maintaining that the USSR has now, and always has had a "systems" and "program" approach to planning.[98]

III. Recent Developments in the System of Incentives for Enterprises

Under the rules of the economic reform as announced by Kosygin in 1965, the success criteria for enterprises were to be fulfillment of plans for sales (or profits) and profitability. Bonuses for managerial personnel were to depend on fulfillment of these plans, along with fulfillment of the plan for production of key products in physical units, and the Ministries were permitted to add other conditions for receipt of bonuses.[99] Enterprises were to form three types of incentive funds—a bonus fund, a fund for social-cultural measures, and an enterprise investment fund. Monies for the funds were to come out of profits, in accordance with complicated formulae relating profit deductions to enterprise performance with respect to the new success criteria, via sets of ministry-set norms that were then taken as percentages of the enterprise wage fund (for the bonus and social-cultural funds) and of the value of capital stock (for the investment fund).

As extension of the reform proceeded during 1966–70, these complicated incentive arrangements were made more so by a series of amendments to the original rules. The experience of enterprises operating under the new procedures disclosed a number of inconsistencies and perversities in the rules and produced types of behavior that the planners did not like. The most frequently cited shortcomings were: enterprises did not pay sufficient attention to raising labor productivity; white collar workers received an unduly large share of rewards from the new bonus funds; tying the norms for forming the incentive funds to the size of the wage fund and to the capital stock did not induce managers to economize on labor and capital costs; the size of

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[95] *Ibid.*, No. 12, 1971, p. 89.
[96] *Ibid.*, No. 7, 1972, pp. 153–157.
[97] *Voprosy ekonomiki*, No. 2, 1972, pp. 28–37. *Ibid.*, No. 11, 1972, pp. 15–27.
[98] *Planovoe khoziaistvo*, No. 6, 1972, pp. 18–29.
[99] The incentive rules are spelled out in decrees and instructions published in Ekonomicheskaia gazeta, *Khoziaistvennaia reforma v SSSR*, Moscow, 1969, pp. 227–231, 235–266.

incentive funds differed widely among enterprises and branches of industry; ministries frequently changed both enterprise plans and the fund-forming norms; contrary to expectations, the new incentives did not strongly motivate enterprise managers to adopt tight plans, improve product quality, be eager to introduce new technology and make new products, or economize on costs. These criticisms amount to a tacit admission that the reforms were not really accomplishing their objectives, notwithstanding the repeated assertions by Soviet planners about the numerous "positive" effects of the reform.

With the expressed purpose of remedying these deficiencies the Soviet government, mainly in a Council of Ministers' Decree of June 21, 1971, has made a number of changes in the incentive system in Soviet industry.[100] The changes relate to (1) the methods of determining the size of the incentive funds for enterprises (2) the establishment of incentive funds in the ministries and intermediate bodies (3) the management of the incentive funds and the criteria for bonus payments. The following sections will describe the present basic incentive arrangements of the economic reform in the industrial sector, as modified by the new approaches. The reader is warned that the journey through this labyrinth will be tedious and wearing; hopefully, he will be rewarded by additional insight into the ways of a bureau-administered economy.

A. Formation of Incentive Funds

The new methods for establishing the bonus and social-cultural funds are spelled out in two official documents issued in April 1971 and May 1972.[101] In contrast to past procedures, the amount of the basic bonus fund for each year in the five-year plan period is now determined for an enterprise by its supervisory ministry. Enterprise funds are set within the limits of the total funds allocated to the ministry as a whole by Gosplan, which sets them for the final year of the plan period, in accord with planned changes in employment by major occupational categories and the planned average wage. Enterprise bonus funds for the intervening years increase in accord with the planned growth of output (*tovarnaia* or *valovaia produktsia*), a target that the ministry also establishes for enterprises. Thus, the "planned" size of the incentive fund is fixed for each year. If an enterprise exactly fulfills the originally planned, annual tasks for output, level of profitability and labor productivity as specified in the five-year plan, its incentive fund for that year will also be as originally planned. If enterprise performance with respect to any of those original targets deviates from plan, the size of the incentive fund increases or decreases in accordance with fixed, "stable" norms for each of the three targets. For the plan period 1971–75, the norms are calculated in stages as follows: (1) in planning the original bonus funds for enterprises the ministry also determines the percentage of the total that is to come from the growth of output, usually 40 percent and from profitability, usually 60 percent; (2) the norm for annual deductions into incentive funds with respect to output is then calculated by multi-

[100] The most complete account of the contents of this decree is found in *Sotsialisticheskiy trud*, No. 9, 1971, pp. 151–153.

[101] Gosudarstvenniy Komitet po Voprosam Truda i Zarabotnoy Platy, *Byulleten'*, No. 7, 1971, pp. 20–31. *Ekonomicheskaia gazeta*, No. 23, 1972, pp. 15–16.

plying its planned share of the bonus fund by the planned average annual growth of output for the five-year period; (3) similarly, the norm with respect to profitability is calculated by multiplying its planned share of the bonus fund by the planned percentage point increase in profitability during 1971–75; (4) the norm with respect to labor productivity is set by the ministry, usually at 0.3. These norms are percentages; they are translated into rubles by multiplying them by the total enterprise wage fund in 1970. Ministries may set them individually for each enterprise in the manner explained, or they may set them uniformly for groups of enterprises or sub-branches.

The new rules attempt to give enterprises an incentive to adopt tauter annual plans than those originally set for them in their five-year plans. If an enterprise adopts higher indices for any of the three targets, its incentive funds are increased in accord with the procedure outlined above. Similarly, if lower targets are adopted, incentive funds are decreased accordingly. If planned targets, whether original or revised, are overfulfilled, the incentive funds are increased, but with the use of norms reduced by at least 30 percent. If targets are underfulfilled, the funds are decreased with the use of higher norms.

In addition to these basic rules, the bonus funds of enterprises are increased or reduced in accordance with enterprise performance with respect to three other indicators. They are the plan for production of key products in physical units; plans for the production of consumer goods in excess of those originally set in the five-year plan, where such goods are not the basic output (notably in heavy industry); and plans for change in product quality and for new products. The relevant norms are fixed by the ministries. The new incentives for consumer goods production are part of the government's current effort to involve most heavy industry enterprises in producing consumer goods, in order to alleviate persistent shortages of these goods, especially small items such as meatgrinders, tableware and kitchen utensils. A Council of Ministers' Decree published in October 1971,[102] specified that consumer goods produced in such enterprises were to be counted in plan fulfillment, something that was not done before. Also, the size of incentive funds and the award of bonuses were made to depend on fulfillment of such plans. The new incentive arrangements with respect to product quality are a part of a recent stepped-up effort to improve quality in general and to stimulate production of new kinds of consumer goods in particular. As previously noted, a Council of Ministers' Decree of June 21, 1971, directed the ministries to classify all products into three categories, to specify for each enterprise the share of total output required to be in the top category, and to provide incentives for raising this share and also for reducing the share of products in the bottom category. Systems of price markups and rebates are to be worked out for products in the two categories. The ministries are to fix coefficients by which the so-called "stable norms" that determine the incentive funds will be raised, in accord with the growth of the share of output in the top category and a reduction of the share of output in the lowest category.

New procedures also apply to formation of the enterprise social-cultural fund and the enterprise investment fund. In contrast to past

[102] *Pravda,* October 29, 1971.

practice, the size of the social-cultural fund is now planned simply as a fixed percentage of the enterprise bonus fund; for the 1971–75 plan period the share is that which existed in 1970. The actual size of the social-cultural fund in each year is affected by the same factors that determine the bonus fund for that year. With respect to the enterprise investment fund, the new rules replace the former complicated procedures with much simpler ones. The funds are formed partly from enterprise profits, and the ministries are now to fix the percentage of profits that is to be allocated to these funds.[103] Although little information has yet been published on the new rules, the size of the funds apparently depends on their size at the start of the plan period and on the amount of planned bank credit to be granted the enterprise for decentralized investment purposes. As before, the major part of these funds will continue to come from a ministry-specified share of regular amortization deductions, and another portion consists of proceeds from the sale of surplus equipment.

B. Establishment of Centralized Incentive Funds

As noted above, under the new procedures Gosplan fixes the limit for total bonus funds for the ministry as a whole in each year. The ministry is permitted to set aside as much as 10 percent of this total to create centralized reserve funds for itself, its main administrations and subordinate associations or trusts.[104] Monies for the centralized funds are obtained as planned percentage deductions from total enterprise profits. If the ministry allows the incentive funds of all subordinate organizations to exceed its authorized ceiling, the excess is taken out of the ministry's reserve fund for the year, or for the next one, and paid into the state budget. The ministry reserve fund is to be used for the following purposes: for increasing the incentive funds of enterprises that raise the percentage of highest category product in their plans and that introduce much new technology; for increasing the incentive funds of enterprises that produce consumer goods that are in demand but that have low prices or yield low profits: for replenishing the incentive funds of subordinate units when their indices are temporarily adversely affected by introduction of new technology or major repairs; to add to incentive funds of subordinate units when deemed necessary in order to keep the fund-forming norms stable. The reserve funds formed in associations, trusts and the like are used for some of similar purposes and also for paying bonuses to their administrative personnel.[105] The formation of this system of reserve funds is regarded as an important step toward achieving one of the original goals of the economic reform, namely, to establish a uniform set of incentive arrangements for all units in the administrative chain, from ministry to enterprise. A further step would place the ministry as a whole on full *khozraschët* and autonomous financing; thus far, this action has been taken for only one ministry—the prestigious and highly profitable Ministry of Instruments, Means of Automation and Control Systems.

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[103] *Voprosy ekonomiki*, No. 11, 1972, pp. 56–57.
[104] *Ekonomicheskaia gazeta*, No. 7, 1972, p. 22.
[105] *Sotsialisticheskiy trud*, No. 1, 1971, pp. 62–66.

C. Uses of the Incentive Funds

The original rules of the reform provided that the enterprise bonus funds were to be used for designated purposes, in accord with annual plans for their use worked out between the enterprise management and the appropriate trade union committee. The bonus fund is to be used to pay bonuses to managerial-technical workers and clericals in accord with established bonus arrangements, to grant annual bonuses to all employees in accord with enterprise performance during the year, to give temporary financial aid to employees in need, to award bonuses for victories in socialist competitions, and to reward especially meritorious workers. The reform gave managers broad discretion over the kinds of bonus systems that could be used, circumscribed by a general regulation on bonuses. As a result, a great variety of practices have developed, both on the part of enterprise managers and on the part of ministries, which approve bonus arrangements for the top management of enterprises. Following a barrage of press criticism of the results of such "spontaneity", the rules were amended several times to tighten control over the expenditure of bonus funds. In particular, limits were put on the increase in bonuses that could be given to managerial employees in a given year, and penalties were instituted for permitting average wages to increase faster than labor productivity. During 1966–70 the bonus funds evidently grew much faster than was intended, and their size varied widely among branches of industry. For example, in 1970, bonus funds were 129 rubles per employee in the building materials industry and 351 rubles per employee in the timber industry.[106] The new procedures adopted for 1971–75 are designed to limit the growth of these funds and to reduce differences in the size of the funds among branches of industry and enterprises. In addition, the Council of Ministers' Decree of June 21, 1971, instructed the ministries, together with the appropriate trade unions, to bring order into the expenditure of bonus funds, and in particular to see to it that (1) bonuses are related more directly to enterprise performance with respect to labor productivity, introduction of new technology and raising product quality; (2) production workers get a larger share of the bonus funds; (3) special rewards for outstanding work are given for improving technology and adding new products. On September 28, 1972, an amended bonus regulations was issued to accomplish these tasks.[107]

As matters stand now, enterprise managerial personnel are paid bonuses, within the limits of monies in the enterprise bonus fund, for fulfilling and overfulfilling the plan for sales (or profits) and profitability, as originally specified in the reform. An obligatory additional condition is fulfillment of the physical assortment plan. Ministries are permitted to add additional conditions, if they see fit. As a result, considerable diversity had developed among the ministries with respect to bonus criteria.[108] The Council of Ministers' Decree of October 1971 concerning consumer goods production in heavy industry requires that

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[106] *Finansy SSSR*, No. 4, 1972, p. 40.
[107] *Sotsialisticheskiy trud*, No. 1, 1973, pp. 155–156.
[108] G. A. Eglazarian and A. S. Kheyfets, *Problemy material'nogo stimulirovania v promyshlennosti*, Moscow, 1970, pp. 102–106. V. I. Kolesnikov *Sovershenstvovanie sistemy premirovania v promyshlennosti*, Leningrad, 1972, pp. 64–70. E. K. Vasil'ev and L. M. Chistiakova, *Effektivnost' oplaty upravlenchestkogo truda v promyshlennosti*, Moscow, 1972, pp. 88–90.

ministries reduce the amounts of managerial bonuses paid for basic indicators, if the enterprise fails to fulfill its plan for delivery of consumer goods. In accord with the September 1972 amendments to the bonus regulation, managerial bonuses are denied or reduced, if the enterprise fails to fulfill its plans for labor productivity and for raising product quality, and if costs are "intentionally" overstated when approval of new prices is requested. Besides the basic bonus, managerial personnel also receive other kinds of payments from the bonus fund, such as lump-sum bonuses at the end of the year. In 1970, total payments from the bonus fund amounted to 31.7 percent of the average salary of managerial-technical workers (ITR) in industry.[109]

In addition to payments from the bonus fund created out of profits, managerial employees can earn bonuses under a number of other arrangements, e.g., for introducing new technology, for producing consumer goods out of waste materials, and for mastering new capacities ahead of schedule. The total of such bonuses often amounts to several months' average salary. In 1970 the Council of Ministers, by special decree, stipulated that the total of all such supplemental bonuses (except that for new technology) could not exceed four months' salary, but an extra two months' salary can be obtained via bonuses for introducing new technology and for victory in socialist competition.[110]

With respect to the use of social-cultural funds, the new provisions make no essential changes. They spell out some additional ways in which the funds may be spent, and they specify that 60 percent of the fund must be used for the construction of housing and related facilities, such as those for child care. The rules governing the uses of the enterprise investment fund also evidently remain the same. Two other incentive-related provisions of the Council of Ministers' Decree of June 21, 1971, are worthy of note, however. One of them revises the rules governing the so-called "Mastery Fund" for recouping enterprises for start-up costs on new technologies and products, by providing that the funds are to be formed so as to reimburse enterprises fully for all start-up costs, including the higher unit costs in the first (and in some cases second) year of serial production. The other change provides that newly constructed facilities are freed from the capital charge only during a period for their mastery that equals the norm established for the branch. Both of these changes in the rules are designed to deal with the intractable problems of reluctance of enterprises to innovate and perennial delays in getting new capacities into full operation.

IV. Conclusions

The most recent developments in planning and incentive arrangements, as reflected in the approach to the Ninth Five-Year plan and now scheduled to continue thereafter, carry out specific proposals made by Kosygin in his announcement of the economic reform in 1965, The nature of these changes and the manner of implementation by the bureaucracy also continue patterns clearly evident in the first several years of experience with the reform. Although there is still much talk

[109] *Ibid*, p. 87.
[110] *Finansy SSSR*, No. 4, 1972, p. 42. *Sotsialisticheskiy trud*, No. 1, 1971, p. 64.

in the Soviet press about economic reform, the phrase now has come to mean simply all changes in economic management procedures that are made to improve the existing system. There is little mention of "spontaneity", except to condemn it, or of granting more decision-making authority to enterprises. Instead, emphasis is placed on finding ways to solve the perennial problems with the retention of central planning and as much central administration as possible. As two authors put it, "Raising the role of economic methods of managing the economy does not mean decreasing the role of administrative methods." [111] Indeed, after seven years of the reform, economic methods, or "levers", have been effectively converted into administrative "levers" by incorporating indexes in the plans in an increasing amount of detail. As a consequence, centralized planning and administration are even more entrenched, and the developments now in process will continue this trend.

The present emphasis on plans with a time horizon of five years or longer changes nothing essential in the system. However, the mania for long-range forecasting is providing many new opportunities for bureaucratic aggrandizement, particularly for the government organs concerned with the glamorous subjects of science and technology and for the numerous scientific and technical research institutes scattered throughout the economy. The results of the forecasting activities now formally set en train ultimately will inundate the planning bodies with a mass of reports. Faced with the urgent, practical task of coming up with detailed, operating plans each year, the planners likely will simply continue their established routine. More and better machines will enable them to make more calculations for these plans and to make them faster. Probably, some of the long-range forecasts will provide the planners with information they might not have had otherwise, and perhaps a few more "optimal" decisions i.e., conducive to less waste of resources, will be made as a result. As is already evident, the idea that directive, five-year plans will provide enterprise with a stable, expectational framework within which to operate is an illusion. Annual plans will be changed when current events require it, as were their predecessors that were not developed within such a framework.

The current leadership clearly has given the green light to the cyberneticists, in the belief, or at least with the hope, that esoteric technologies and "scientific," i.e., mathematical, techniques will make the economy perform better. The government bureaucracy has gotten the message and now seems to be proceeding full steam ahead to take advantage of the situation for its own purposes. The process of assimilating the new computer-based, technologies into the bureaucratic routine is in full swing. Resources and people have been allocated to launching the grandiose projects to establish nationwide, uniform information systems, data banks, computer networks, and the like, and to computerize everything that seems to be susceptible of computerization. Given the present state of the computer art in the Soviet Union, let alone the present capabilities of mathematical modelling, the ultimate outcome of this vast undertaking is problematic, to say the least. What is clear, though, is that a large amount of bureaucratic activity has now been launched to carry it out, including assignment of specific planning

[111] *Voprosy ekonomiki*, No. 1, 1972, p. 70.

tasks to designated agencies and imposition of bureaucratic controls over fulfillment. The task of coordinating all this activity is staggering. The grand scheme could, of course, be quietly abandoned when the costs mount, as were some of Stalin's canals. More likely, however, the time schedules for the projected systems and their numerous subsystems will merely be pushed continually forward, like the schedules of typical Soviet construction projects. The system's designers will be able to cite the immense, real difficulties and complexities involved, but in true bureaucratic fashion they will also be able to cite their calculations of the large resource savings that the new systems will bring about. Ultimately, a disillusioned leadership may withdraw its political support, in favor of some other approach to economic management. In the interim, some components of the overall scheme may prove practical and be incorporated into planning practice.

The many recent actions taken in the name of the economic reform show that Soviet planners more than ever before are trying to obtain micro-efficiency in the economy over wide ranges of problems by increasing the number of indicators in the plans. Productivity is to be raised, new technologies adopted, new products produced and product quality upgraded by devising statistical indicators to measure performance with respect to the objectives, inserting the indicators in the plans and tying incentives directly to achievements with respect to some or all of them. Thus, planning has become ever more detailed, a process that has been greatly facilitated by the availability of computers. Moreover, the designing and monitoring of the many new plan parameters is being carried out in diverse bureaucratic channels. The more detailed and technical these parameters are made, the more difficult it is to obtain consistency among them. Thus, the task of internal plan coordination becomes more complicated. Finally, the attempt to enforce efficiency and technological progress via plan indicators increases the degree of centralization. More of these indicators are being established centrally for enterprises. Although the original reform reduced the number of such targets from 38–40 to nine key ones, six new targets have been added since 1970. They are: labor productivity, gross value of output, assignments for consumer goods production in heavy industry enterprises, tasks for raising product quality, assignments for reducing material and fuel expenditures per unit of output, and the size of basic incentive funds.

This multiplication of plan indicators greatly complicates the task of the enterprise manager in devising ways to get things done and also in deciding which of the numerous assigned chores he should attempt to do. His task is made more difficult by the attendant changes in incentive arrangements. Despite repeated pleas for simplification of the extremely complicated incentive structure, each new change in the rules has complicated them further. The revised methods of forming incentive funds were designed to eliminate specific inconsistencies and perversities in the old rules. The new approach of "planned" incentives is also intended to induce managers to adopt taut plans, that is, to keep them from continuing to conceal real production possibilities from the planners, for fear of the imposition of higher targets in the next year. Also, the traditional reluctance to innovate is supposed to be overcome with the use of the centralized reserve funds and the provisions for extra bonuses. At the same time, however, ceilings are

put on total bonus funds and on individual bonuses. Despite all this tinkering with the rules, the root of the problem is not touched. The managers' bonuses still are tied to fulfillment of plans, even more of them than before. This fundamental fact is likely to maintain traditional managerial behavior patterns, as Soviet critics have already started to point out.[112]

In conclusion, the latest round of modifications in Soviet planning and incentives leaves the essentials of the system unchanged, but adds to the degree of centralization and to the complexity of administrative arrangements. The innovations also help to swell the administrative bureaucracy, which has increased nearly one third since 1965.[113] As clearly exemplified in the Ninth Five-Year Plan, the planners' pressure on resources—taut planning—continues unabated. The familiar chronic malfunctions persist, and the problem of devising incentive schemes to remove them continues to defy solution. Finally, the efficacy of monetary incentives is being eroded by the continuing unavailabilities of desired goods and services. The strong, current emphasis on "moral incentives" and the heightened pressure for "shock work," socialist pledges and socialist competitions of all kinds is the familiar and predictable response of the political leadership.

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[112] *Ibid,* No. 10, 1972, pp. 15–25.
[113] *Narodnoe khoziaistvo SSSR v 1971 godu,* p. 347.

RESOURCE ALLOCATION POLICY: CAPITAL INVESTMENT

By KEITH BUSH

Resource allocation is the essence of Soviet political economy. Planned capital investment outlays may be regarded as the sinews of any medium-term plan and reveal more about the Soviet leadership's actual, as opposed to declared, economic priorities. Similarly, the over- or underfulfillment of investment plan targets often shed light on subsequent shifts in resource allocation policy.

It has not always been easy to assess in detail the resource allocation policy of successive Soviet administrations since, for a third of a century, no complete planned investment breakdowns have been published. For instance, the sections of the published draft and approved directives for the Eighth (1966–70) and Ninth (1971–75) Five-Year Plans devoted to investment allocations contained few specifics.[1] However, in a welcome liberalization of information policy, a fairly detailed version of the Ninth Five-Year Plan was published in mid-1972,[2] the first such document to be widely promulgated since the 1930's. Scattered throughout this volume are what must be considered to be the authoritative and definitive planned investment allocations for most of the principal sectors of the economy and branches of industry. No planned investment figures for the period after 1975 have been published, other than an earlier statement by the Chairman of the USSR Gosstroi to the effect that overall investment was expected to double by 1980.[3] This would imply an average annual growth rate of overall investment of some 7.2 percent, which is also the growth rate projected for the period 1971–75.

The scattered and incomplete investment targets from the published Ninth Five-Year Plan document are assembled in Table 1. They are supplemented by the most authoritative data for the period 1971–75 available from other published sources and juxtaposed with the aggregate totals actually allocated during the two preceding five-year periods, namely 1961–65 and 1966–70. The purpose of the tabulation is to show the absolute magnitudes of investment by major recipients allocated during the latter years of Khrushchev's administration and then under the present leadership, and to illustrate the shifts in resource allocation since Khrushchev.

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[1] See *Pravda*, February 20, 1966, April 10, 1966, February 14, 1971, April 11, 1971 and November 27, 1971.

[2] *Gosudarstvenny piatiletniy plan razvitiia narodnogo khoziaistva SSSR na 1971–1975 gody*, Politizdat, Moscow, 1972 (hereafter referred to as *9 FYP*).

[3] *Pravda*, June 27, 1969.

TABLE 1.—CUMULATIVE GROSS FIXED INVESTMENT FROM ALL SOURCES OF FINANCING BY BRANCH OF INDUSTRY AND SECTOR, 1961–65, 1966–70, AND 1971–75 PRELIMINARY

[Billions of rubles: constant prices of 1955 and 1969]

Sector and branch	Prices of 1955			Prices of 1969		
	1961–65	1966–70	Percent growth	1966–70	1971–75 Preliminary	Percent growth
Total investment	211.8	303.0	43	353.8	501.0	42
Industry	76.4	106.8	40	126.2	[1] 208.4	[2] 50
(Group A)	(65.5)	(90.8)	37	(107.2)	(2)	(2)
(Group B)	(9.9)	(16.0)	62	(19.2)	(2)	(2)
Fuel-energy branches	(2)	(2)	(2)	42.9	63.0	47
Electric power	9.0	12.2	35	13.6	18.1	33
Fuels	14.2	20.7	42	23.1	(2)	(2)
Coal	5.2	6.3	21	7.4	9.3	26
Ferrous metals	7.0	9.0	27	10.2	17.5	66
Nonferrous metals	4.0	5.6	40	6.7	9.6	40
MBMW	12.1	20.2	67	23.2	43.7	90
Machinebuilding	(2)	(2)	(2)	12.1	23.2	90
Automobile	(2)	(2)	(2)	3.9	7.0	81
Chemicals and petrochemical	7.4	9.6	30	11.1	21.0	91
Building materials	4.6	5.7	25	[1] 4.7	[1] 6.2	31
Wood and cellulose	4.2	4.9	14	6.0	12.0	100
Food, meat and dairy, Fish	6.3	9.1	44	9.5	13.9	46
Food	(2)	(2)	(2)	3.8	5.6	50
Meat and dairy	(2)	(2)	(2)	2.3	4.2	80
Fish	(2)	(2)	(2)	3.4	4.1	19
Light	2.7	4.7	74	5.5	10.3	90
Agriculture, productive	34.2	55.4	62	[2] 68.4	108.4	59
State	18.4	32.0	74	[2] 40.3	71.0	76
Kolkhoz	15.8	23.4	48	[2] 28.1	37.4	33
Construction industry	5.7	9.9	75	[2] 11.5	14.6	27
Transport and communications	21.1	28.0	33	32.8	50.3	53
Transport	(2)	(2)	(2)	29.9	45.7	53
Railways	6.9	8.4	22	9.8	15.7	57
Pipeline	(2)	(2)	(2)	3.8	10.0	160
Communications	(2)	(2)	(2)	3.3	4.6	36
"Nonproductive sphere"	(2)	(2)	(2)	93.9	113.1	21
Housing	38.7	49.8	29	60.5	73.5	22

[1] Not available.
[2] Gosplan data cannot be wholly reconciled with TsSU data.

Sources: Drawn or derived from Gosudarstvennyy piatiletniy plan narodnogo khoziaistva SSSR na 1971–75 gody, Politizdat, Moscow, 1972, passim and "Soviet capital investment since Khrushchev," Soviet Studies, July 1972, pp.91–96

Certain reservations should be registered about the contents of Tables 1 and 2. In the first place, the Soviet and Comecon statistical handbooks covering the period since 1969 give investment data in constant prices of 1969. Previous handbooks carried investment data in constant prices of 1955. The two sets of prices cannot be reconciled in every case. As authoritative investment data for the period 1966–70 in constant prices of 1966 have not been disseminated, link relatives or surrogates have been used where necessary.

Investment outlays expressed in the new norms and estimate-cost prices of January 1, 1969 appear on average to be some 17 percent higher than the figures of July 1, 1955, although the differential varies between sectors and branches. This factor should be borne in mind when comparing absolute data and percentage growths for different plan-periods. For, consciously or unconsciously, Soviet spokesmen have on occasions tended to juxtapose planned allocations for 1971–75, couched in 1969 prices, with investment outlays during the period 1966–70 expressed in 1955 prices, thereby overstating the planned increases.

Other principal reservations include the fact that the investment data in so-called "comparable" prices of 1955, which appeared in successive statistical yearbooks throughout the 1960's, were periodically

amended without explanation and are not wholly comparable. The categories used by the USSR Gosplan do not always coincide with those employed by the Central Statistical Administration (TsSU).

Considerable confusion has been apparent in both Soviet and Western utterances on the politically sensitive area of agricultural investment. Tables 1 and 2 show productive investment in agriculture rather than the concept of total agricultural investment commonly cited. The latter includes housing, hospitals, schools, etc., and its use could lead to double-counting. It would also be misleading when assessing the priority accorded to the various sectors: for example, expenditures upon the housing of industrial workers and employees do not generally appear under the heading of industrial investment. Finally, for reasons best known to itself, the TsSU insists on lumping together investment outlays on "the construction of trade and communal enterprises, timber and procurement enterprises and scientific, cultural, artistic, educational and health institutions."[4] Absolute figures are given to the nearest 100 million rubles. Most of the slight discrepancies between sub-totals and totals are attributable to rounding.

TABLE 2.—PERCENTAGE DISTRIBUTION OF CUMULATIVE GROSS FIXED INVESTMENT FROM ALL SOURCES OF FINANCING BY BRANCH OF INDUSTRY AND SECTOR, 1961–75

Sector and branch	1961–65	1966–70	1971–75 preliminary
Total investment	100.0	100.0	100.0
Industry	36.1	[1] 35.2	[1] 41.6
(Group A)	(31.4)	(30.0)	[2]
(Group B)	(4.7)	(5.3)	[2]
Fuel-energy branches	[2]	12.1	12.6
Electric power	4.2	4.0	3.6
Fuels	6.7	6.8	[2]
Coal	2.5	2.1	1.9
Ferrous metals	3.3	3.0	3.5
Nonferrous metals	1.9	1.8	1.9
Machine-building and metalworking	5.7	6.7	8.7
Machine-building	[2]	3.4	4.6
Automobile industry	[2]	1.1	1.4
Chemicals and petrochemicals	3.5	3.2	4.7
Building materials	2.2	[1] 1.9	[1] 1.2
Wood and cellulose	2.0	1.6	2.4
Food, Meat, and dairy, Fish	3.0	3.0	2.8
Light	1.3	1.6	2.1
Agriculture, productive	16.1	[1] 18.3	21.6
State	8.7	[1] 10.6	14.2
Kolkhoz	7.5	[1] 7.7	7.5
Construction industry	2.7	[1] 3.3	2.9
Transport and communications	10.0	9.2	10.1
Nonproductive sphere	[2]	26.5	22.6
Housing	18.3	16.4	14.7

[1] Gosplan data cannot be wholly reconciled with TsSU data.
[2] Not available.

Source: Derived from table 1.

In view of the problems of comparability and reconciliation arising from the factors listed earlier and from the diversity of sources employed, the data reproduced in Tables 1 and 2 must be regarded as tentative, as must any conclusions drawn from them. Nevertheless, certain observations may safely be made on the basis of these figures and of other published sources.

The share of total investment allocated to agriculture has continued to grow throughout the period under review, with the increase

[4] See, for instance, *Narkhoz 22–72*, p. 327.

attributable entirely to the state sector. This reflects the expansion of the sovkhoz system and the market increase in expenditures upon land improvement, the main burden of which is borne by the state. For instance, some 6.1 billion rubles have been earmarked for land improvement schemes during 1973 alone.[5] It is significant that the plan for 1973 provided less investment for many sectors than had been stipulated in the Ninth Five-Year Plan, but left the agricultural investment vote untouched.

After Khrushchev's impulsive drive to "chemicalize" the economy overnight, capital constipation ensued and investment in this branch had to be curtailed for a few years. Recently, investment in the chemical industry has again begun to grow rapidly, with much of the increased capacity destined for the production of agricultural chemicals.

The very high rates of growth of total gross investment recorded during the 1950's were halved in the 1960's. The five-year aggregate increases were 89 percent in 1951–55, 87 percent in 1956–60, 45 percent in 1961–65 and 43 percent in 1966–70, with an aggregate growth of 42 percent planned for the period 1971–75.[6] The dominant feature of the "Stalin growth model" has been an extremely high rate of growth of the capital stock: this increased by nearly 14 times during 1928–70,[7] a period which witnessed the great destruction of World War II. The declining rate of growth of new investment has not yet worked itself out in the rate of growth of the capital stock: fixed productive capital grew by 43 percent in the period 1966–70 and is expected to increase by a further 50 percent or so in 1971–75.[8] However, a substantial slowing down may be expected during the second half of this decade. For, as has been convincingly demonstrated elsewhere,[9] the maintenance throughout this decade of anything like the 9 percent growth rate of the capital stock which was characteristic of the 1950's and the 1960's would require allocation of over half of the GNP to gross investment by 1980.[10] Such course would be not only politically unacceptable but also economically counter-productive. A more probable outcome suggested was an average annual growth of some 6 percent in the capital stock, yielding an average annual growth of the GNP of just over 4 percent.[11]

The steep decline in capital productivity in industry apparent in the first half of the 1960's was almost halted during the second half of that decade. However, it continued to drop and is expected to decline further by 1975.[12] The return on productive capital investment throughout the economy, on the other hand, actually improved during the period 1966–70, with the increase in the national income per ruble of productive investment rising from 29 kopeks in 1961–65 to 35 kopeks in 1966–70. Yet this is expected to fall back to 31 kopeks by 1975,[13] presumably due in large part to the growing share of in-

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[5] *Pravda*, December 19, 1972; cf. *Finansy SSSR*, No. 1, 1973, p. 12.
[6] *9 FYP*, p. 219.
[7] *Ibid.*
[8] *Voprosy ekonomiki*, No. 4, 1971, p. 33.
[9] Abram Bergson, *"Toward a New Growth Model," Problems of Communism*, No. 2, 1973.
[10] Assuming an average annual increase in employment of about 1.3 percent and a joint factor productivity increase of 1 percent per annum.
[11] Bergson, op. cit.
[12] *Planovoe khoziaistvo*, No. 5, 1972, p. 13.
[13] *Ibid.*, p. 10; cf. *Voprosy ekonomiki*, No. 3, 1973, p. 30.

vestment devoted to agriculture with diminishing returns and to the exhaustion of readily accessible and relatively inexpensive deposits of raw materials.

A chronic complaint of the Soviet economy ever since the outset of industrialization has been the high volume of incomplete construction. The relationship of the value of this incomplete construction to the annual volume of new capital investment rose from 76 percent in 1967 to 80 percent in 1970,[14] and was one of the highlights of Premier Kosygin's stern lecture to the USSR Gosplan in late 1972.[15] This phenomenon would seem to stem from a combination of factors: too many applicants each press for too large a slice of the available investment cake with the result that most receive an inadequate portion;[16] a clash of authority and lack of coordination between the planning and the financial organs; requirements are often understated in order to get a project approved on the principle that once a project is started then additional funds will somehow be found for its completion,[17] and then there are the other cost-overrun problems not unfamiliar to us in the West.

Insofar as the structure of investment is concerned, the share of state investment in the total is already high and is steadily growing, from over 85 percent in 1966–70 to over 86 percent in the current five-year plan period,[18] with a corresponding diminution in the proportion attributable to the kolkhoz sector, to housing cooperatives and to private housing construction. A more dramatic increase is taking place in the share of productive investment in total investment; namely, from 73.5 percent in 1966–70 to a projected 77.4 percent in 1971–75. Some 28 percent of this total productive investment during the current five-year plan period is destined for agriculture.[19]

One of the principal features of the September 1965 reform program was the expansion of decentralized investment through the enterprise's production development fund, on the very logical grounds that a director could better judge certain requirements of his own enterprise than some distant central authority. Decentralized investment was scheduled to grow to about one fifth of total industrial investment.[20] But, just as the share of decentralized investment was belatedly approaching this level, Premier Kosygin came out with trenchant criticism of its use for non-productive construction and for allegedly low-priority projects.[21] The plan for 1973 correspondingly envisaged a sharp, absolute cutback in decentralized investment,[22] which runs counter to the essence of the original reform program.

In conclusion, we might look at the light which past and projected investment allocations shed upon the current declared emphasis on consumption. As has been widely propagated, "the main task" of the Ninth Five-Year Plan is purportedly "to ensure a significant increase in the people's material and cultural standard of living."[23] Of course, it is wholly understandable that politicians in any country should

[14] *Ibid.*, p. 12.
[15] *Ibid.*, No. 11, 1972, p. 5.
[16] See, for instance, *Voprosy ekonomiki*, No. 11, 1972, p. 15.
[17] On this, see *Trud*, January 19, 1973.
[18] *9 FYP*, p. 221.
[19] *Ibid.*, p. 223.
[20] *Den'gi i kredit*, No. 4, 1967, p. 70.
[21] *Planovoe khoziaistvo.*, No. 11, 1972, p. 5.
[22] *Pravda*, December 19, 1972.
[23] *9 FYP*, p. 73.

declare themselves to be in favor of higher living standards. As with motherhood, the flag and conservation, who could possible be against a better life for everyone? But is this laudable objective supported by the pattern of resource allocation?

From Tables 1 and 2 it is evident that the share of total investment going to agriculture has grown in the 1960's and is planned to grow at an appreciable rate in 1971–75. The proportion of industrial investment allocated to Group B also rose from 13 percent in 1961–65 to 15 percent in 1966–70 and will undoubtedly rise further in 1971–75, although its share remains modest. But the above-average increases in investment in agriculture and in Group B projected for the period 1971–75 appear to be more than offset by the below-average increases set for non-productive investment, the bulk of which is devoted to housing and to the construction of health, education, welfare and cultural facilities. This may be crudely illustrated by adding up all the identifiable investments in those sectors and branches which directly benefit the consumer, namely agriculture, the food and related industries, light industry and the "non-productive sphere." Such a calculation indicates that "consumer-oriented" investments account for a smaller proportion of the total investment planned for 1971–75 than was actually allocated in 1966–70. Moreover, there are signs that some consumer-oriented investments are currently being reduced to below their original planned levels.

The above exercise leaves out of consideration the consumer-oriented investment in heavy industry, as exemplified by the Tol'iatti plant. It also ignores investment in Group A2 projects which will eventually benefit the consumer. However, these two factors are offset by the other than consumer-oriented output of, say, agriculture and of scientific institutions. Above all, such a formulation illustrates merely short-term developments. Any kind of shift into consumption requires a lengthy prior period of investment: as has been noted, much of the currently high increase in investment in the chemical industry will benefit agriculture and, ultimately, the consumer. The Tenth Five-Year Plan (1976–80) may well turn out to be more "consumer-oriented" than any of its predecessors. But, judged merely from the promulgated pattern of investment, this description is hardly applicable to the present leadership's resource allocation policy up to the present time.

SOME ISSUES IN SOVIET ENERGY POLICY FOR THE SEVENTIES[1]

By ROBERT W. CAMPBELL

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The supply and demand outlook for energy is currently a matter of world-wide interest. It is closely tied to many goals of economic policy such as growth, protection of the environment, and technical progress; it also is important in world politics. It affects all countries and none more so than the Soviet Union, which plays an extremely important role in the world energy picture as an owner of a large share of total energy resources, as one of the countries that can supply technology for fuel production, as one of the biggest consumers and as a significant participant in world trade in energy resources. In this decade of concern about energy, how does the situation look from Moscow? What special features of their situation make the outlook distinctive for them? How do they seem to be assessing and reacting to the issues of energy policy? Soviet assessments and decisions for the near term are revealed or reflected in the Five-Year Plan for 1971–1975. But many of the issues that are most important to the United States will find their sharpest expression only after 1975, and in this paper we will look beyond that date to the end of the decade.

We can start with the general question of how tight the energy situation is going to be for them and to what extent they feel the pinch of increasing scarcity and rising costs.

RESERVES

Some general reminders about the Soviet fuel and energy resources may be in order. The U.S.S.R. has tremendous reserves of all the traditional energy sources—gas, oil, coal, and water power. In addition, they have large reserves of several lower grade sources such as peat, shale, and firewood. The role of these low-grade resources, however is constantly declining and this trend will continue. One of the major trends of recent years and one projected to continue into the future is the shift toward a progressive fuel balance in which oil and

[1] For detailed background on the Soviet energy economy, see Robert W. Campbell, *The Economics of Soviet Oil and Gas*. Johns Hopkins, 1968.

gas predominate in total primary energy production, and in which strip-mined coal becomes the most important form of solid fuel.

Like the United States, the U.S.S.R. has tremendous reserves of coal—311 billion tons, omitting brown coal and counting only A+B+C categories. Its place in energy policy is determined more by its competitive cost position than by the supply as such. In gas, the Russians claim to have the largest reserves in the world. Reserves in the categories $A+B+C_1$ were claimed to be almost 18 trillion cubic meters as of the first of 1972. In the more speculative categories of the reserve classification there are many times that amount still to be explored. With reserves at 75–80 times current annual production, there are some gas fields such as the Urengoi field (which contains reserves of 2 trillion cubic meters of gas) that can simply be held on the shelf as candidates for foreign-assisted export development schemes quite outside any current plans.

Information on oil reserves cannot be disclosed under the Soviet state secret act, so that we have no solid information on Soviet oil reserves. Nevertheless there seems little doubt that the Russians have very large reserves of oil. In the 1950's they found very large quantities of oil in the Volga-Ural region which were the basis for the rapid expansion of output in the 1960's. Those fields are now reaching a point where output from them is declining rather rapidly, and output in the Volga-Ural region can be maintained only by quite expensive exploration and development of smaller and economically less attractive fields. It turned out that output from these fields will ultimately be smaller than originally projected, and that they reached their output peak earlier than expected. As an example of how disappointing the production in the old areas has been, the Party Secretary of the Bashkir ASSR predicted in 1966 that Bashkir output would be 56–57 million tons by 1970, but in fact it turned out to be only 39.2 million tons.

The reserves that are to provide for expansion of output in the 1970's are those in Western Siberia, western Kazakhstan (Mangyshlak) and to a smaller extent in Belorussia and some of the older areas. It is claimed that the output targets for western Siberian output to 1975 are fully supported with explored reserves,[2] and that half of the explored reserves of the Soviet Union are now in this region. Soviet spokesman have been more than usually close-mouthed in making statements about how reserves have moved over the last five years, so it is not clear whether the big discoveries in Western Siberia have been enough to offset exhaustion elsewhere or whether the reserves-to-current-output ratio has moved up or down. Whatever, the actual tightness of the present reserve situation, however, there are very likely to be quite extensive additional reserves discoverable if enough effort is made. There is a great deal of unexplored but promising area in the Soviet Union—whole regions that have not been extensively explored, deep sediments and types of trap that have so far been neglected, and large areas offshore in the Caspian, Black and Baltic Seas, that have barely begun to be explored. Also, in their original exploration strategy the Russians concentrated on looking for big finds and in any of the old areas there are undoubtedly a large

[2] *Ekonomika neftedobyvaiushchei promyshlennosti*, 1971 :4, p. 4.

number of smaller but commercially usable prospects still to be proved up and developed.

Constraints on the Supply Side

Location

Despite the generally favorable reserve situation here are numerous obstacles to finding, producing, and utilizing these resources. The first is a difficult location problem. The hydroelectric power, the coal, the oil, and the gas are all heavily concentrated in generally remote and inhospitable environments in Siberia and Central Asia, while the regions of demand are located in the more western parts of the country. Transportation is consequently a very important cost. The Center gets a very large portion of its natural gas from Central Asia through a pipeline system over four thousand miles long. It seems impossible to deal with this locational problem from the other direction, by basing growth in the fuel regions or by moving the industries, people, and investment to the surplus areas. There has long been a strong Soviet prejudice for such a solution, i.e., for the complex development of regions on the basis of basic fuel and energy sources. These efforts, however, have never been particularly successful, though large investments have been made in them. Some of the big hydroelectric projects built in Siberia went largely unutilized for many years. The basic bottleneck seems to be the problem of attracting people to these underdeveloped areas, which lack productive infrastructure and amenities and are in very unpleasant environments. This Siberian prejudice is increasingly under attack now, and the present approach seems to be to accept that these resources must be transported to European Russia.[3] There are also important pressures against it because of the desired speed of development. The demand in the European areas is urgent and oil and gas ministries under pressure to expand output cannot wait. Moreover, they find it cheaper to follow a capital-intensive lightly-manned strategy of development that minimizes the development of infrastructure. They often can get around the lack of infrastructure by organizational and technical means such as automation, operating from bases built outside of the region, using helicopters instead of roads, shipping the fuel and energy out to developed markets elsewhere.[4] One consideration that gets a lot of verbal attention but less action is the goal of developing backward areas. There may be political reasons that inhibit the planners in this regard. Central Asia is one of the fastest-growing areas in terms of population, its income is relatively low. It might appear that it would be sensible to use these energy resources as a base of local industrialization. But the Russians may not be especially eager to develop these non-Russian areas into strong and independent challengers to central authority.

The lack of infrastructure, the adverse climatic conditions, and remoteness make development of these resources costly. In Western Siberia, exploration work, drilling, and pipeline construction can be done only in the winter time. There is no existing transportation sys-

[3] For more details see the excellent survey by Leslie Dienes, "Issues in Soviet Energy Policy and Conflicts over Fuel Costs in Regional Development," *Soviet Studies*, July 1971.
[4] These problems, also, are admirably covered elsewhere; Robert N. North, "Soviet Northern Development: The Case of NW Siberia," *Soviet Studies*, October 1972.

tem, which makes it difficult to bring in the heavy equipment required; much of it is transported by air. But apparently the oil and gas deposits of this region are so large and so productive that the prospecting, investment, and production costs are still favorable compared to alternative sources in the Soviet Union. According to the Party Secretary of Tiumen oblast', investment costs per incremental ton are far below the average branch cost.[5] There are numerous such statements but I have yet to find detailed data on drilling and production costs that would substantiate this.

One indication of the generally high cost of these resources once they are produced and transported the required distances is the fact that the Russians have decided to build a significant amount of atomic power generating capacity in the Ninth Five-Year Plan. In 1970, the Soviet Union produced 3.5 billion KWH from such plants, (less than half of one per cent of total output) but of all the new generating capacity to be added in the Ninth Five-Year Plan, 11 percent (7.2 gigawatts) is to be in atomic power plants.

Technological Demands

The exploitation of many of these resources requires the mastery of new and demanding technology—leaps into the unknown or breakthroughs on problems at which the Soviet oil and gas industry has often failed. To produce the Siberian gas requires development of a new production system that includes wells of extra large diameter, a technology for producing from several horizons in a given well at once and slant drilling so that the well heads for a large number of wells can be clustered on an artificial island. To move the necessary volumes of gas the distances involved at a reasonable cost it is necessary to build very large diameter pipelines; some of those under construction are of 1.42 meter pipe. Extraordinarily large compressor stations are also required for these lines and they are now planning to use gas-turbine powered compressors of capacities up to 25,000 kilowatts, whereas they have been fumbling for a decade with mastering the much smaller 6–10,000 kilowatt compressors.[6] Oil will be moved from the West Siberian fields to the European part of the U.S.S.R. through a 1220 mm line which is to be equipped with individual pumping units with capacities up to 12,000 cubic meters per hour. This again is much larger than any equipment mastered so far. One of the sources on which they are counting for oil output—the region around Mangyshlak—contains oil with a very high wax content which poses special problems both in extraction and pipeline transport. One large deposit of gas to be brought into production during this period (to provide something like a fourth of the total 1971–1975 increment) is favorably located in Orenburg oblast' in the European U.S.S.R., but has a high content of sulphur compounds and condensate which will require the creation and mastering of a new gas processing capability. Many of the other new gas fields also have large condensate potentials. The construction and operation of gas processing plants has been a perpetual weak spot in the gas industry; the large targets set in each plan have been consistently and drastically underfulfilled.

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[5] *Ekonomicheskaia Gazeta*, 1972 : 49, p. 12.
[6] *Gazovaia promyshlennost'*, 1971 : 3, p. 8.

All these features represent serious constraints on the supply side of the energy picture. The difficulty is expressed both in cost and in how fast output can be increased, and there is some trade-off between these two variables. For example it now looks as if the new big pipeline from the West Siberian oil fields to Al'metevsk will not be completed before the summer thaw arrives. That could mean a year's delay in getting the pipeline finished and a serious setback for production in the West Siberian fields.

These difficulties in the way of expansion have been corroborated by the developments of the first two years of the Five-Year Plan. The Russians set a reasonably high target for energy output in the Five-Year Plan with some projections extending to 1980 that were similarly optimistic. They planned fuel output to grow somewhat faster than during the previous five-year period, presumably with the expectation that they could once again get fuel exports to grow appreciably. Within that total the share of oil and gas was to rise from about 60 percent to about 67 percent. The share of coal was to fall but the share of strip-mined coal within the total was to rise from 26.7 percent to 30.9 percent. Performance during the first two years, however, indicates that these targets are more or less out of the question. Output in 1971 came close to plan but 1972 saw considerable underfulfillment, and in response to this experience and to the investment pinch they are feeling after the disasters of 1972, the annual targets for 1973 have been reduced below the original plan. The oil target now set for 1973 is 424 million tons compared to 420 million tons in the Five-Year Plan and that for gas is 238 billion cubic meters compared to 250 billion cubic meters in the original plan. There are also ominous indications for the period beyond 1975 regarding the preparation of oil reserves. The Five-Year Plan envisaged a shift away from emphasis on exploration toward production drilling, and also set optimistic targets for improvements in drilling. Rig productivity was to rise by 70 percent in exploratory drilling, 50 percent in development drilling. Actually in 1971 and 1972 there was virtually no increase in rig productivity in either category[7] and it seems likely that there will be a further shift toward production drilling to meet the output targets, a development which would make the oil reserve situation precarious for the second half of the decade. The growth of coal production has been satisfactory and indeed the plan for coal has been overfulfilled but not enough to make up for the shortfall in oil and gas, the fuel output target as a whole is not being met.

Domestic Demand

It is very difficult to forecast Soviet domestic energy requirements in any intelligent way. One approach is simply to project the trends of the recent past, noting factors that may alter them in the near future. The fuel balances published in the annual statistical yearbooks show a decline in the rate of growth of domestic fuel and energy consumption over the last two decades. From an average annual growth rate of 7.7 percent in the fifties, it fell to 6.1 percent in 1960–65, and further to 5.3 percent in 1965–1970.[8] These changes in the rate of growth are the

[7] *Ekonomicheskaia Gazeta*, 1973 : 5, p. 2.

[8] These tables are somewhat ambiguous conceptually, especially as to what "other sources" might be. Domestic consumption is conceptualized as primary energy production corrected for net trade.

net result of a great variety of forces, both positive and negative in their influence on the growth of energy demand. They include the decline in the rate of growth of GNP, changes in branch structure, the introduction of more energy-intensive technologies, and many others. But I suspect that one of the most important forces conditioning the decline in the rate of growth of fuel consumption was a shift to more efficient fuels and fuel-saving processes—substitution of higher grade fuels for firewood in the household sector, shift from steam to diesel and electric traction on the railroads, reduction in the fuel rate in electric power generation both from raising the technical parameters and from replacing low-grade fuels with gas. It seems unlikely that in this combination of forces any strong role has been exerted by the growth of income-elastic uses—private automobile transportation, household consumption via a proliferation of appliances. But it seems likely that in the future the influence of the forces favoring increases in energy requirements per unit of aggregate output may increase relative to the economizing influences. As household incomes rise, and as the Russians permit the growth of the automobile stock, income-elastic energy demands will make themselves felt. The strong drive for technological progress in the new growth strategy offers much latitude for the introduction of energy-intensive processes. The U.S.S.R. still has a relatively low energy use per capita, compared to more advanced countries. One Soviet authority shows it as 4.11 tons of conventional use per capita in the late sixties compared to 5.14 in Czechoslovakia, 5.45 in Eastern Germany, 5.27 in the United Kingdom, and 10.27 in the United States. Many of the biggest economizing possibilities of shifting to better fuels and improving utilization technology are coming to an end as the Russians raise the share of oil and gas in the total supply, complete the shift of railroad traction to new technologies, and dieselize much of the internal combustion engine stock. In electric power generation, the Soviet fuel rate, which a few years ago was appreciably higher than that of the United States, now is equivalent to ours.

Possible Projections of Demand and Supply

What is the significance of the foregoing for the role of the U.S.S.R. as a net supplier of energy resources to the world market? To review the history briefly, the U.S.S.R. shifted during the 1950's from the position of a net importer of energy resources to that of a net exporter, and in 1960 had net exports equal to about 7 percent of primary energy production. This grew gradually during the early sixties to stabilize at around 12 percent.

To project the position through the near future to 1975 we might reason as follows. Suppose that domestic demand continues to grow at the 1965–1970 rate of 5.3 percent per year. The Ninth Five-Year Plan projects the growth of primary energy production at about 6 percent per year. The differential in these two rates applied to the production-consumption balance in 1970 would generate by 1975 an increment available for increasing exports of about 150 million tons of conventional fuel. There are also other indications that an appreciable increase in energy exports was planned. Petroleum production was to rise by 4.32 percent, primary runs to stills by 40.1 percent; in explaining the Directives for the Plan Kosygin mentioned big increases in the

amounts of gas, oil, and electric energy to be delivered to the Eastern European countries, and the Plan itself mentions similar intentions for coal and coke.

It is obvious, now, however, that any such optimistic projection for energy exports is unrealistic since the output targets are not being met. Primary energy production planned for 1973 [9] is about 1,475 million tons of conventional fuel, which represents an average annual rate of growth for these three years of only 5.0 percent. The failure of the economy to grow as rapidly as planned surely means that demand will also be curbed, but even so this comparison suggests that the Russians are going to be very hard put to squeeze out much of an increment for fuel and energy exports.

The situation beyond the Ninth Five-Year Plan to 1980 does not look much better. On the supply side some of the shortrun bottleneck problems that have held back growth in the early years may ease, especially those in gas production and transmission. Otherwise there is little reason to expect that it is going to become easier to expand output. About the only positive thing to offset the putative strength of the forces increasing the growth of domestic requirements is the possibility that the general growth rate of the economy will stabilize at a low enough level in the last half of the decade to dampen the rate of growth of domestic demand. In sum, it seems likely that it will be difficult to do much during the seventies to increase the flow of energy outputs available for exports. And if the experience of 1971–73 is any indication, this is likely to be especially true for oil, which is by far the most important element in energy exports. Such an effort would face rather steeply rising production costs.

An additional complication is the obligation the Russians have to the countries of Eastern Europe.[10] Of all Soviet energy exports in 1970, about 32 percent went to these six countries, and they accounted for roughly the same share of exports of crude petroleum and products. This share has grown over time, from from about 24 percent in 1960. These countries as a group have very limited fuel and energy resources and have been covering their energy deficits from the U.S.S.R. Actually the U.S.S.R. provides more than their total deficit in energy sources, as a consequence of which Poland is able to export coal outside the group. For oil as well, the U.S.S.R.'s net shipments to Eastern Europe slightly exceed their net import enabling them to have net exports of products outside the group. It should be added that even with imports of Soviet oil, these countries have not been able to move very far toward a reduced role for solid fuel. In the late sixties oil and gas constituted only 21 percent of their energy consumption. Considering the five countries other than Rumania, the share was only 13 percent.

Here we come to one of the anomalies of Soviet fuel policy. The Russians have repeatedly and unambiguously expressed a strong unwillingness to continue to meet these needs, especially as they grow to 1980

[9] The most important elements are given in the 1973 Plan in *Ekonomicheskaia Gazeta*, 1972 : 51, and the rest can be estimated reasonably closely.

[10] Reference is to the six Eastern European members of Comecon-Bulgaria, Hungary, Eastern Germany, Rumania, Poland, and Czechoslavakia. Rumania has its own oil and gas but does get coal and coke from the U.S.S.R. Cuba also depends on the U.S.S.R. for petroleum, but that demand remains at a more or less constant level and is governed by a distinct set of circumstances.

and 1990.[11] Nevertheless they have apparently decided to continue to do so at least through 1975. Indeed, according to the Ninth Five-Year Plan, virtually all the increment in Soviet energy exports during the period is pledged to Eastern Europe. It is uncertain whether this commitment will continue into the second half of the decade. At one point some Soviet writers were saying baldly that the Eastern European countries should turn to the Middle East for their oil supplies [12] but this was at a point in the sixties when the Minister of the Oil Industry, Mr. Shashin, was offering very pessimistic views about petroleum production and export potential. It may be that the reluctance to let Eastern Europe turn to the Middle East was an important force in pushing the Party to authorize a big push in Western Siberia in its decree at the end of 1969. More recent statements as to what the East Europeans must do seem less extreme, though they are still being counseled to develop atomic power as a substitute. We will return later to an exploration of the possible implications of this ambivalent attitude toward Eastern Europe's energy needs.

Against this background, we can conclude with a series of questions and propositions concerning the big fuel policy dilemmas the Russians face, especially those relevant to U.S. interests. The choices they will make on these issues are not fully predictable, but these are the permanent dilemmas under which policy must be made, and which should be at the center of our attention in following Soviet energy policy during the decade.

The Russians have a big interest in selling energy resources in hard currency areas. They find this advantageous even if the ratio of the foreign currency earnings to domestic ruble opportunity costs is low. The fact that they are willing to push the production margin into areas where the cost per ton of oil is 14–15 rubles and more, that they are eager to divert crude oil from East European customers where they can get a nominal return of something like 19 dollars per ton to sell it in hard currency areas where they get approximately 10 dollars per ton, all suggest that the goods they get in return for the hard currency are extremely valuable to them. The reason, of course, is that those are high-technology goods that have a high productivity, offer big savings in their use in the Soviet economy, and the chance to accelerate Soviet technical progress by serving as a training and prototype stimulus. There is little doubt that they need foreign assistance precisely in the oil and gas sector. Imports of oil field equipment (code 128 in the Soviet import classification) doubled from 1969 to 1970, and again from 1970 to 1971. One of the biggest purchases of U.S. industrial equipment concluded since the new trade agreement is a $20 million order for submersible pumps. In his review of the economic situation before Gosplan after the wheat deal, Kosygin pointed out the conflict between spending scarce foreign exchange to get the large-diameter, high-quality pipe (to handle 75-atmosphere pressures) required to get the gas to market, and trying to meet the quality and schedule requirements if this pipe were to be produced domestically. One of the biggest bottlenecks in meeting the output goals for Western Siberia is the lack of lighter rigs, easily assembled

[11] See, for example, *Voprosy ekonomiki*, 1971 : 12.
[12] E.g. A.M. Tomashpol'skii, *Neft' i gaz v mirovom energeticheskrom balanse*, M, 1968, pp. 140–141.

and disassembled, and better transport means to move them about in the wastelands of Western Siberia.

The need for technologically advanced imports inclines them to a big effort to expand energy exports—and especially oil and gas. The uncertainties are in how they evaluate the opportunity costs figured as diversions from shipments to Eastern Europe, as making the capital commitments to expand reserves and output and move the fuel to distant markets, or the substitution costs of altering the structure of internal consumption to free the oil and gas that are most easily exportable of the various energy resources. There seems to be some lurching about in the darkness here. The Soviet system contains a lot of inertia, and it takes a real convulsion to achieve a review of alternatives and a decision to alter allocations, as they apparently did in the decision to make a big push in Western Siberia.

In this light, how shall we explain their treatment of the Eastern European demands? Why do they continue to commit so large a share of their exports to Eastern Europe while complaining so bitterly about it, and when they are so much in need of the foreign currency they could get by selling energy in Western Europe, in the United States, or to Japan, especially as the price rises. This ambivalance is based on a kind of political consideration that keeps them in a disequilibrium state economically. Until now Soviet trade policy has been dominated by the desire to maintain Comecon as a preferential trading bloc, a kind of customs union. In such a bloc it is quite possible for *all* the partners to lose economically. Each one as a seller finds that in some cases the preference given to him means that he can charge higher prices than if he were selling in a larger group, but that in others, the limitation to this smaller circle of customers means he must accept poorer deals than if he could deal with buyers outside the group. As a buyer, each member gets some benefits through having fewer competitors, in others, he loses because he must seek his imports from a smaller group of sellers. But overall, all lose, with one of the interesting questions being how the overall loss is shared. It is this phenomenon that explains the contradictory attitude of the Russians toward the question of supplying energy for the Comecon countries. Both the Russians and the East Europeans lose—the Russians because they get payment in goods of lesser value to them than the goods they could get by selling that energy elsewhere. The East Europeans, tied to a single high-cost energy source, forego the possibility of getting energy on better terms elsewhere. The fact that the Russians are the main supplier would imply that they can shift the burden mostly to the smaller Eastern European customers. But apparently the Russians have not been able to realize this gain. They have been made very aware of the high domestic opportunity cost of oil by their price reform in 1967, which made them take explicit account of finding costs, interest costs, and rent, all of which were introduced into their price structure at that time. In a period when they have had a hard time expanding output fast enough to keep exports to Western Europe growing, they have also felt the foreign exchange opportunity cost. But to judge from the unit values which can be calculated from the foreign trade handbooks through 1971, they have been unable to raise the price to the East Europeans despite their frequent warnings to the Eastern Europeans that this must happen. I have been unable to deter-

mine to what extent they have been successful in their other approach, i.e. requiring the Eastern European recipients to contribute part of the capital costs of developing new sources.

Probably the only way they could get out from under this commitment in any serious way would be to allow the East European countries to redirect their trade significantly outside Comecon, and the Russians are reluctant to let this happen. There is no doubt a political advantage to the Russians from having these countries tied to it in a trading bloc, and from having the important hold of supplying a vital commodity to them. But the economic tension is very great, and will no doubt increase as the pressure on world energy supplies increases.

Parallel to this tension is another, that deserves more study than it has so far been given. If the Russians should ever decide to let the bloc open up in respect of trade in energy resources, then there is another opportunity that could perhaps exceed the potential gains from selling energy in the developed countries for advanced-technology goods. This is the situation in the Middle East. The Soviet Union has large energy resources, but it is hard to escape the conclusion that they are relatively high-cost resources. One way to avoid these costs would be to get more gas and oil from Afghanistan, Iran and the Middle East as they are already doing, though on a rather small scale. The agreement with Afghanistan involves 60 billion cubic meters of gas over the period 1967–1985, with deliveries in 1971 at about 2.5 billion cubic meters. Also in 1970 the Russians received first deliveries of gas from Iran which are to amount to about 6 billion cubic meters per year rising to 10 billion cubic meters per year when compressor stations are completed. They are also buying a small amount of oil from Iran, scheduled at the rate of about 2 metric tons per year in 1973–75. The Ninth Five-Year Plan also mentions oil imports from Algeria and Egypt.

A great expansion of imports from this area would make economic sense. The Middle Eastern countries have a strong motivation. As M. A. Adelman contends, the contemporary energy shortage is partly contrived.[13] The Organization of Petroleum Exporting Countries (OPEC) acts as a cartel, setting the price at monopoly levels but having to accept a corresponding limitation on output. One way to increase monopoly gains is by discrimination, i.e., selling additional output at a price below the monopoly price, to customers who would not otherwise buy it, with a guarantee that they will not put the output back on the market, undercutting the monopoly price. The marginal cost of oil in the Middle East is far below the price the cartel is enforcing, and there will be great temptation to increase revenues by selling oil on the side. This is all the more true since this is not a monopoly, but a cartel, in which different members have divergent interests. Each country faces a calculation as to how to manage its main asset—the oil and gas in the ground. One possibility is to leave it in the ground, to avoid depressing the current selling price, and in the hope that its value will appreciate with time. An alternative is to get it out of the ground now, accepting the penalty of selling it at less than it might ultimately bring so that it can be turned into some kind of productive

[13] M. A. Adelman. *The World Petroleum Market.* Baltimore : The Johns Hopkins University Press, 1972.

asset with a net physical productivity and capable of enhancing the value of other assets such as labor.

Some Middle Eastern countries would surely be tempted by the vision of turning their oil and gas into socialist-produced capital goods. And this should be attractive on the other side—the marginal cost of oil in the Middle East in terms of real resources is surely below that in the U.S.S.R., and if the Russians could put the resources now being lavishly expended to expand their own energy output into the Middle East instead, the productivity of those resources would be higher.

All this has a bearing on the much discussed question of what role the Soviet Union may play in expanding the supply of energy on the world market. Some would like to see the Russians as a major alternative source of energy that can help in the developed countries' bargaining with the OPEC cartel, and help them meet their energy needs at lower costs. Unfortunately, the two potential actions just outlined that might do this are mutually inconsistent. The condition for getting more of the energy needs of the U.S.S.R. and Eastern Europe met by oil from the Middle East to free more Soviet output to sell to the West is that the Russians not expand their energy exports into markets where they would compete with OPEC oil! This sleight of hand can be supported to some extent by transport costs. Indeed that is what primarily explains Soviet energy imports from the Middle East at the moment, but there would seem to be tight limits on how far this can expand.

This tour of the possibilities may be translated into two final implications. The first is mildly encouraging. The two trading disequilibria—with the Middle East and with Eastern Europe—may neutralize each other. If the Russians can neither let Eastern Europe take advantage of cheap Middle Eastern oil nor do so itself, then the prospects for energy exports to the more developed countries are a straightforward matter of balancing domestic marginal costs against the gains. After an early euphoric optimism, both sides have been somewhat sobered by a careful look at the costs, though the final judgment is still to be rendered. The other implication is more ominous, namely that there is a great advantage to the Soviet Union, and a great temptation, to acquire some political control over areas in the Middle East so that it can overcome the economic objection the present owners of Middle Eastern oil would have to providing the U.S.S.R. with oil that would enable it to expand energy sales on the world market.

POLLUTION COMES TO THE U.S.S.R.[1]

By MARSHALL I. GOLDMAN

CONTENTS

I. INTRODUCTION

After variously denying, underplaying, or ignoring that it existed, the Russians have finally come around to acknowledging that environmental disruption is a serious problem in the U.S.S.R. Soviet expressions of concern are inevitably prefaced by the litany that "Of course in capitalist countries pollution is more serious and less likely to be remedied," but once this concession to ideological niceties has been made, the catalog of problems in the Soviet Union is practically the same as it is in the United States.

The seriousness of these problems is reflected by the fact that in 1972 for the first time in history, pollution was the main issue before a full session of the Supreme Soviet of the U.S.S.R. The discussion was led by V. A. Kirillin, a Vice Chairman of the Council of Ministers and concluded with the adoption of a "Resolution on Measures for the Further Improvement of Conservation and the Rational Utilization of Natural Resources." This, in turn, was followed by yet another resolution of the Central Committee of the Communist Party and the Council of Ministers of the Soviet Union in January 1973 entitled "About Strengthening the Preservation of Nature and Improving the Use of Natural Resources." The role of various government organizations in fighting pollution was spelled out in this resolution. Some headlines in the United States even conveyed the impression that the Russians were creating a somewhat weaker counterpart to the American Environmental Protection Agency.[2] This seemed to suggest that there would be a much more effective and coordinated campaign against pollution in the future.

[1] Copyright 1972–1973 by the MIT Press and Marshall I. Goldman.
[2] *New York Times*, January 1973, p. 11.

At the present time such expectations seem overoptimistic. A closer look at the January 10, 1973 decree indicates that no such coordinating agency was created. In fact, rather than create a super agency to systematize the attack against pollution as has been done in U.S. and other countries, the Russians continue to treat pollution in a segmented and uncoordinated fashion. Since national planning and coordination is supposed to be much easier when the state owns all the means of production, the Soviet failure to establish an effective anti-pollution agency suggests that coping with environmental disruption in a socialist or communist state may not be as easy as some Russian or Western specialists claim. An effort to explain why pollution exists or is so difficult to eliminate in the U.S.S.R. reveals much about the Soviet system itself as well as much about the disadvantages and advantages of the approach we have used in the United States to cope with our own pollution crisis. Such a study should also add perspective to the American-Soviet joint agreement on international cooperation in environmental protection.

II. History

In evaluating environmental questions in the U.S.S.R., it is necessary to keep in mind what the Soviet Government has had to deal with. Russia after all was essentially an underdeveloped country prior to the revolution. Only 215 cities had centrally supplied water systems and these systems furnished water to only a limited portion (usually the wealthiest) of town.[3] Sewage disposal was even more limited. For the most part, the Russians depended heavily on outdoor wells and outhouses. Moreover, most of the population and industry were concentrated in the western part of the country whereas the bulk of the country's water and other raw materials were in Siberia. As the post-revolutionary government expanded industry and agriculture, it needed increasing amounts of water and sewage disposal facilities.

No one cared too much about pollution as such in the 1920's, but conservation and the protection of natural resources was something of an international concern even then and Lenin signed some quite forward-looking legislation. However as might be expected from a leader concerned about the survival of his new revolutionary government, conservation was not the prime focus of Lenin's efforts. Nevertheless, for the early 20th century, at least in terms of legislation adopted, Lenin's record was a good one.

Even before Lenin died, however, conservation was increasingly neglected in the effort to industrialize. Today when the value of economic growth is being questioned, in the the developed countries, some may argue in retrospect that the Soviet Union should have placed less emphasis on economic growth. At the time, however, it was considered a prerequisite for survival for international reasons (capitalist encirclement), domestic reasons (failure to improve living conditions would strengthen those who advocated counterrevolution), and for ideological reasons (to improve the well being of the common man). After all, the Soviet Union then was in much the same position as the

[3] Marshall I. Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union*, Cambridge, MIT Press, 1972, p. 86. (Unless otherwise indicated, most of the material for this paper is taken from this book.)

developing countries have been in the post-World War II era. Just as in the 19th century when Marx and others called religion "the opiate of the masses," so "progress" has become the opiate of the masses in our day. It is the promise of an industrialized heaven on earth that makes tolerable the sacrifice inflicted on a country in the throes of industrialization.

As other developing countries were to discover in their time, one of the reasons industrialization is so difficult is that poor countries have a shortage of capital. The strategy for development therefore is to stretch the available capital as far as possible. Inevitably this means there will be little available for electrostatic precipitators for air treatment or tertiary treatment plants for sewage control. Money spent on such projects is simply money diverted from the purchase of new machine tools which might otherwise make possible an increase in production. The very words "conservation" vs. "production" convey the sense that environmental concerns are a roadblock to "progress."

The shortage of capital has other implications for the environment as well. When capital is in short supply, production functions not only rely heavily on labor, but they tend to be raw material intensive. This means capital resources will normally be treated with more care than raw materials and that there will not be much concern over spilt oil or wasted iron ore.

The shortage of capital had a noticeable impact on what was done about the provision of sanitary facilities in the Soviet Union. During the 1920's and 1930's, despite a major spurt of urbanization, only minor amounts were spent in increasing urban water supply facilities and even less was spent on sewage treatment. The Russians did little along these lines to reduce their lag behind other urban areas of Western Europe. It was only in the 1950's under Khrushchev that expenditures for water supplies and sanitary treatment increased in any meaningful way. Even then, scant efforts and resources were directed to solid waste disposal until the 1970's.[4] Prior to that, land fill and open burning were virtually the sole methods of disposal.

The tendency to rely heavily on raw materials has also been reflected in the rather careless way the Russians have treated their forests. Keeping ordinary citizens from wantonly chopping down trees frustrated Seventeenth-Century feudal lords; the communists have not been much more successful. The stimulus for one of Lenin's first conservation laws was his discovery that workers from the Bogatir' Factory in Moscow were cutting down the trees in Sokolniki Park. Lenin subsequently banned the cutting of timber with a 20 mile radius of Moscow. But such legislation was often ineffective. The woodlands in an area of 19–25 miles around most large cities in the North and Siberia have been denuded. The preservation of forests has been further hampered by the existence of financial incentives for exporting timber. Timber accounts for as much as 6% of all Soviet exports. As a result of such policy, the forests in the European part of the Russian Republic (RSFSR) have been badly overcut. It is expected by 1980 that there will be virtually no forests left in the Ukraine.

Because of the seemingly large capital costs entailed in arranging for delivery of substitute fuels to the Moscow area and the availability of brown coal, lignite, and peat deposits already in the Moscow area,

[4] *Izvestiia*, September 21, 1972, p. 5.

the decision was made to exclude almost all but Moscow coal from the capital. The quality of the local fuel was so poor, however, (the ash content of the lignite and peat was as high as 50%) that air pollution was a serious matter. It was only in the 1950's that the ruling was altered and it was decided to bring in anthracite coal from the Donets Basin. Consequently, the general level of ash emission in Moscow in 1954 fell to 46% of what it had been in 1950 and then to 21% in 1960 when the planners finally decided to substitute oil and natural gas.

III. Coming of Age

While initially Russia's environmental problems were mostly those common to any developing country, with time and industrialization environmental difficulties in the U.S.S.R. began to develop characteristics that were often unique to the U.S.S.R. Some of these issues were due to the pervasive role of government in the Soviet Union and some due to Soviet ideology.

A. Government

Although in theory, government ownership of the means of production is supposed to make it easier to protect the environment, in fact in some cases it may be more difficult than if private ownership is allowed. This can be illustrated in a variety of ways.

An example of how government ownership of the means of production can hamper rather than help environmental control can be seen in the recent debate on whether or not a strong centralized environmental protection agency should be established in the U.S.S.R. Such a move seemed to make good sense and was supported by officials inside the Soviet Union and the experience of most of the other developed countries of the world. In anything as difficult to implement as environmental control, it is essential that responsibility be pinpointed and control coordinated. Environmental control becomes next to impossible if there are numerous ministries involved and each is exhorted to control their own particular sector. Inevitably conflicts of interest arise. Responsibility is shrugged, the buck is passed and no one is assigned responsibility. Moreover, it is in the nature of environmental control that effective action with one form of environmental disruption spawns environmental disruption of another form. For example, scrubbers wash down effluent of chimney stacks, but in doing so, transfer the waste from the ambient air to a water body. Or more emphasis may be placed on hydroelectric power and dam building, but this leads to flooding of villages and other negative ecological consequences.

Several Soviet specialists recognize the complications and have argued strongly for the creation for a new super-coordinating agency.[5] Their arguments were to no avail. A decree such as the one issued by the Central Committee of the Communist Party and the Council of Ministers of the Soviet Union on January 10, 1973, which entrusts responsibility for the environment to eight or more organizations is doomed to be ineffective. Except for demanding increased action from the Ministry of Land Reclamation and Water Resources, the Ministry of Agriculture, the State Committee for Forestry, the Ministry of Fisheries, the State Committee for Supervision of Safe Work-

[5] *Izvestiia*, September 21, 1972, pp. 5. 7.

ing Practices in Industry and Mining, the Chief Administration of Hydrometeorological Services, the State Committee for Science and Technology, the Ministry of Health and the All Union of Republic Ministries in general, the January 10, 1973 resolution carries environmental control no further than it was before. True, the Chief Administration of Hydrometeorological Services has been authorized to increase the monitoring of the environmental condition of the air, water, and land, but not much more. For the most part, this organization had such power before.

This failure to net by the Soviet Government and Communist Party comes not only after a lengthy debate within the Soviet Union itself, but after similar debate and action throughout the rest of the developed world where almost all these countries have now established Environmental Protection Agencies, Council of Environmental Qualities, or Ministries of the Environment. The creation of a unified organization in and of itself is not a cure-all, as a continued persistence of the problem in the United States, Japan, and the United Kingdom indicates. Yet concentrating environmental concerns in the hands of the Environmental Protection Agency and the Council of Environmental Quality in the United States and taking them out of the agencies of the Department of Agriculture, the Department of Defense, the Department of the Interior, the Department of Health, Education and Welfare, the Department of Transportation, and the Department of Housing and Urban Development to name a few, has noticeably increased the effectiveness of the American program. (We still have duplication in the United States. In addition to the Environmental Protection Agency, we still have the Council for Environmental Quality, the Atomic Energy Commission, The Army Corps of Engineers, the Forestry Service, etc. Nonetheless, much of the previous duplication has been eliminated.)

Environmental concerns have come late to the Soviet Union, and so allowance should be made for the fact that the Russians lag behind the United States in coming to grips with pollution. But in the field of environmental affairs, three years is a long time. In effect, there still is no one organization in charge of environmental affairs in the Soviet Union. Until they came up with the Chief Administration of the Hydrometeorological Service, it was even uncertain which organization the Russian would select to serve as a counterpart to our Council of Environmental Quality in the American-Soviet joint agreement on Environment.

What makes it so difficult for the Russians to create an Environmental Protection Agency or a Council on Environmental Quality? A moment's reflection will show that any such organization in the Soviet Union would cause all kinds of havoc. After all, the first priority of every Soviet enterprise is to increase production. It would be confusing, to say the least, to have another state organization come along and insist on measures which would curb production. This may be possible some day, but not as long as increased production is the country's prime priority. At the present time premiums for the Soviet manager depend almost entirely on his increasing production or sales. This explains why it is so difficult to induce Soviet managers to spend money on the installation of pollution control devices. Such devices almost certainly mean a temporary if not permanent reduction in

production and by extension, employee premiums. As a minimum, a reordering of priorities will be necessary before Soviet managers can be expected to be more cooperative in the effort to control pollution.

The myopic concentration on production pervades not only industry, but government administration. In the same way that factory managers are evaluated, urban, regional and republic officials are judged by how much industrial and agricultural production has increased within their jurisdictions. The road to bureaucratic advancement is not likely to be paved with the kind of production bottlenecks that an insistence on pollution control will bring. Enterprise manufacturers and city mayors have a community of interests that generally spells disregard of the environment.

The Government ownership of industry has an adverse effect on the environment in other ways as well. With the new emphasis on environmental control in Western countries, entirely new corporations and new organizations have sprung up to take advantage of the rapidly growing demand for equipment and services. In contrast, flexibility in general, and innovation in particular, especially in new areas of industrial activity comes slowly in the U.S.S.R. It is not enough to have an idea and a friend at Gosbank in order to begin producing a new product as it often is in the non-communist world. In the Soviet Union, new products or new industrial lines must usually find a niche somewhere in an existing ministry. Unfortunately the uniqueness and unconventional nature of the environmental protection industry makes it hard to find such a notch. As a result there seems to be no such thing as a pollution control industry in the Soviet Union. Existing ministries have moved slowly to expand their production lines to encompass such products.[6] Much of the work continues to be performed on a custom basis.[7] It may upset the radicals and anti-imperialists when American stockmarket investors reason that "there is money to be made in pollution," but at the same time, such sentiments reflect the fact that industrial entrepreneurs in the United States vie with one another to step in to fill the market with new equipment. Government ownership and the incentive system in the Soviet Union make such an action a rarity.

B. Ideology

The environment is affected not only because the Soviet Government owns all the means of production, but also because the prevailing ideology in the Soviet Union is a strain on the environment. While no one, even in the Soviet Union, insists today that the Marxist labor theory of value is the sole determinant of all processes in the Soviet Union, it is still enough of an influence to have a negative impact on the environment.

Unless some specific exception is made, resources under the labor theory of value are treated as free goods. Moreover, at least until recently, that is just the way resources have been treated in the Soviet Union. Labor was a source of all value and all other factors of production were free. Gradually, however, Soviet engineers and increas-

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[6] *Izvestiia*, September 22, 1972, p. 2; *Sotsialisticheskaia Industriia*, Sept. 26, 1972, p. 2.
[7] *Izvestiia*, Sept. 20, 1972, p. 2.

ing numbers of economists began to realize that regardless of ideological pronouncements, many factors of production were indeed in short supply and were being consumed in a wasteful, extravagant manner. Unfortunately when anything is treated as a free good, we tend to consume excessive quantities of it. But like free love, after a while we run the risk of exhaustion.

The planners began rapidly to compensate for the absence of a pricing-allocative mechanism. For the most part, informal rationing procedures were established. However, once the ration has been allocated, there was no incentive by the recipient to economize on the use of his resource, especially if he had any assurance that there would be more from where those rationed sources came. This system has proven so wasteful and so dependent on political and personal pull, rather than on economic usefulness, that the Government finally conceded the necessity of charging for capital and land. As part of the Soviet economic reform of the mid-1960's, interest on capital and rent on land were officially authorized. Unfortunately, the value of raw materials, particularly those still in the ground have not been so wisely treated. The effort to attach a value to national resources has been fought in several stages. Actually this has been the subject of recurring debate in the Soviet Union. Most recently, it has focused on a charge for water and an effort to attach value to all forms of raw material.

The battle over water reached its peak between April 1970 when a draft of a proposed water law was published and December 1970 when a water law was finally adopted. Several of the country's leading mathematical economists, such as Khachaturov, Federenko and Loiter argued forcefully that there would be no rational utlization of water in the Soviet Union until a meaningful charge was levied on all water consumed. Presently households do pay a token fee for water consumption, but the impact and size of the fee is limited. The failure to charge a more meaningful sum is partially due to the opposition of ideologists but also to the bad taste associated with past attempts to levy a fee for water when the fees charged were too low to affect the consumption of water in any serious way. At the same time these rates were high enough to be regarded as another one of Stalin's burdens imposed on the poor peasants who needed large quantities of water for irrigation. The combined effect of ideology and history was that the December 1970 Water Law emerged as a limp document devoid of meaningful provisions.

The effort to attach a value to all raw materials has a much longer history. It has attracted more interest, but has been just as fruitless. At times the discussion about raw materials has been encompassed within the general debate over the implication and wisdom of a rental charge which reached a peak on the pages of *Voprosy Ekonomiki* from 1967–1970. While some forms of rent are now being charged, virtually no charges have been authorized on raw materials. The one and perhaps only exception is a stumpage fee that logging companies must pay to the government budget. This fee is based on the reserves of standing timber assigned logging companies.[8]

Just how wasteful such a policy can be is reflected in the Soviet recovery rate in the mining of raw materials. Generally recovery rates

[8] *Literaturnaia Gazeta*, August 16, 1972, p. 10.

in the Soviet Union are low. It is not unusual to find recovery rates of 50% or less. K. E. Gabyshev mentioned several instances of 50% recovery rates and I. U. Sukhotin reports losses of 50–60% on the extraction of coal, oil, potassium, and natural gas.[9] Another critic complains that there is a higher zinc, lead and copper content in the abandoned slag of the non-ferrous metallurgical industry in Kazakhstan than there is in the mines presently being worked.[10] Such waste is only to be expected when the mine operator has no need to worry about a careful sifting of his ore. It is hard to dispute the logic of such an approach. The raw material is free, but the mine worker is not. Therefore, the mine operator seeks to attain as much output per laborer as he possibly can. Under the circumstances since the material in the ground is free to him, he will simply move on to another part of his mine deposit or to a new mine where the ore content is higher and more accessible.

Bureaucratic bungle helps to compound the faulty economics of the situation. Generally responsibility for the extraction of various kinds of minerals is divided up among different ministries. However, many ores in nature appear in complex compounds intermingled with other minerals. Thus iron ore may also contain copper and lead and apatite may be combined with nepheline, a valuable mineral used in the production of aluminum.[11] Unfortunately, the Ministry of Ferrous Metallurgy is usually unauthorized to process non-ferrous metals, and has no funds to handle such materials.[12] As a result, it frequently happens that the spoils that are discarded are more valuable than the basic product that is extracted.

As Soviet economic growth continues, the Russians will come to rely heavily on the extraction of raw material not only for domestic use, but increasingly for export, where raw materials have constituted as much as 52% of total Soviet exports in recent years. Indicative of this attitude is the willingness, even eagerness, of the Soviet government to sell off natural gas reserves. The Russians have made major long-term commitments to the Germans, Austrians, Italians, French and Finns. They are seeking desperately to work out somewhat similar deals with the Japanese and Americans. In the case of the United States, both private conversations and public reports indicate that the Russians are so eager that they have agreed to sell liquified natural gas at the port of Murmansk at sixty cents a thousand cubic feet—a price which is estimated to be far below even their construction and operating costs.[13] Unless major changes are made, including the introduction of an economic charge on raw materials in the ground, the wasteful exploitation of raw materials will continue. At the present time, however, the likelihood of a change in policy is not very great. Sometimes it is even difficult to obtain a public hearing for those who seek an economic charge. Thus, Academician N. Federenko complains that an article of his raising these same questions had been submitted to the highly regarded economic journal, *Planovoe Khoziaistvo* in 1970. As of August 1972, however, the article still remained in the

[9] *Izvestiia*, November 20, 1972, p. 2.
[10] *Izvestiia*, September 21, 1972, pp. 4–5.
[11] *Izvestiia*, September 22, 1972, p. 2.
[12] *Izvestiia*, September 22, 1972, p. 2.
[13] *New York Times*, January 9, 1973, p. 54.

offices of the journal with no indication of when if ever it would be published.[14] For an academician of Federenko's stature, this two-year freeze is most unusual and only highlights how controversial such a reasonable proposal is.

The concept of scarcity has no place in Marxism. Granted that even with a well running price system, the vast territory of the Soviet Union makes it hard at times to realize that certain materials may some day be in short supply. Increasingly, however, ecologists and some economists have come to recognize the planet's limitations. In the case of Marxist-dominated economics, however, recognition that the planet is limited is more likely to bring about frustration rather than conservation because the Soviet pricing and planning mechanisms provide little help in dealing with the situation.

Marxism also rules out the role of private property. Without doubt, private property owners have intensified the desolation of the environment in countless instances. Strip mining is a good illustration. On other occasions, however, private property can serve as a barrier to environmental disruption. The private property owner may fear financial loss if his neighbor decides to open a pigpen or an iron smelter. On such occasions, the threatened private owner may take as active, if not a more active role, than the state in seeking protection for the environment. Of course, the results may not always be so beneficial for the environment. Thus, if a promoter offers to buy my seashore cottage for an oil well, his offer may be so attractive that I cannot resist. If, however, he wants it for a stone quarry, the opportunity cost of foregoing my hideaway for rest and relaxation may be greater than what the promoter can pay and I will decide to keep the seashore area in its present state. In a socialist state without private property, no such first line of defense exists. If someone decides a quarry will be built, there is no one to protect at the local level and assert a higher claim. For the most part, the property is there for the taking.

C. Combined Factors

In some of the illustrations provided above, the environmental disruption was caused either by ideology or the peculiar governmental framework of the Soviet Union. There are however occasions when both factors are at work.

While imposing a charge on all raw materials and eliminating organizational idiocy would go a long way towards reducing environmental disruption, the "ultimate solution" requires a fundamental reorientation in the goals of the society and in the planning and incentive processes. As long as the plan calls for nothing but growth and more growth, the environment is bound to suffer. As a minimum, some provision should be made in the plan to provide for some kind of target of pollution control. One of the most discouraging aspects of pollution control in the Soviet Union at the present time is that even when funds are appropriated for pollution control, more often than not they are either unexpected or underexpected.[15] In fact, one critic complained

[14] *Literaturnaiia Gazeta*, August 16, 1972, p. 10.

[15] *Pravda*, August 3, 1968, p. 1; *Trud*, November 12, 1966, p. 2; *Vodosnabzhenie i sanitarnia tekhnika*, April 1970, p. 11; October 1970, p. 37; A.A. Ivanchenko, ed., *Ekonomicheskie problemy razmeshcheniia proizvoditel'nykh sil SSSR* Moscow, Nauka, 1969, p. 240.

that in the six years prior to 1967, no industry in the Russian Republic, the Ukraine. Belorussia, and Turkmenistan had fulfilled its plans for the construction of purification and treatment equipment.[16] One of the reasons for such lack of cooperation was explained earlier. The installation of such equipment or the changing of production processes would threaten the successful completion of the production and profit plan. To be effective, pollution control targets should be encompassed in the plan itself and accorded equal weight with the production indices.[17] Almost any other procedure will result in the downgrading of the environment. This explains why pollution control installations always lag so far behind schedule in the Soviet Union. Soviet contractors receive a far smaller bonus for completing the construction of treatment plants than they do for finishing the construction of basic production facilities.[18] Under the circumstances, the unusual thing is to find a treatment plant that opens on schedule or simultaneously with the beginning of plant production. In the interim, the factory emits its effluent untreated into the air or water.

Nor does the factory manager have much incentive to see that the treatment facilities are completed on time. If anything, he has a disincentive. The sewage treatment facilities are a burden to him since they reduce his profitability. As in the United States, sewage installations are included in the capital cost structure of the Soviet firm. Thus, the Soviet manager has to pay interest to the state for such a facility and wages to the staff that must operate it, while the facilities in themselves usually add little or nothing to output or profit.[19]

To some extent the lack of normal financial incentives can be offset by the uses of fines imposed on those who pollute. So far, however, there is little evidence either in the Soviet Union or elsewhere to indicate that such measures have been entirely successful. Invariably the fines prove to be too little and too late. Seldom if ever do fines for pollution in the Soviet Union exceed $120, and normally they are much lower. Moreover, even when the fines are high their effectiveness is destroyed because in pollution-prone industries, an allowance for a payment of fines is often included in the enterprises' financial plan. Thus, the imposition of a fine does not threaten the profitability of the enterprise. Moreover the fines paid for pollution can usually be more than offset by successful completion and overfulfillment of the production plan which makes it more rational to produce and pollute rather than slow production. If anything, local officials periodically have had a vested interest in encouraging firms to pollute. Prior to January 1, 1962, local officials were entitled to keep the pollution fines they collected and add them to their operating budgets. Understandably most officials were more interested in collecting on pollution rather than cutting it off.

Finally Marxist ideology, Russian history and the Soviet style of government have combined to make it illegal for conservationists to form any non-governmental conservation groups or lobbies. The Soviet Union is denied the benefit of the checks and balances that a pluralistic system brings. The Russians have nothing comparable to our League of

[16] *Izvestiia*, February 4, 1967, p. 3.
[17] *Sovetskaia Estoniia*, July 7, 1972, p. 3.
[18] *Izvestiia*, October 22, 1972, p. 3.
[19] *Izvestiia*, October 22, 1972, p. 3.

Women Voters, Sierra Club, Friends of the Earth, or Audubon Societies. Occasionally ad hoc groups will join together to criticize certain ills such as the pollution of Lake Baikal. At the present time, however, these groups have no formal institutional ties, nor can they, unless they choose to work through official state organizations such as the Society for the Preservation of Nature. Here, however, they would immediately come under the domination of state officials and would be expected to share the dominant view which in regards to the environment is "manifest nature." Is it realistic, for instance, to expect the Society for the Preservation of Nature to take a strong stand on the dangers of dam construction and the value of swamplands and wildlife refuges when the president of the group in the Russian republic is N.G. Ovsiannikov, who in real life is the vice-chairman of the Ministry for Land Reclamation and Water Management?

At one time it was appropriate to say that state and local government officials in the United States were tools of the polluters, particularly in places like Maine. Given the strength of the conservation law in the United States today, certainly this is no longer the case. As much as anything, the outpouring of environmental legislation and action is due to the pluralistic nature of our system where our government officials find themselves beset on all sides by opposing lobbies. The situation in the Soviet Union today resembles the old days in Maine. The absence of pluralism makes it inevitable that only the spokesmen for one side will be listened to—and that side in the Soviet Union argues that there must be more production at all costs—even if it means environmental disruption.

IV. Future

Despite the institutional handicaps which exist, some faint but encouraging signs of environmental action can be noted in the Soviet Union. Increasingly, the Russians find themselves faced with the same environmental pressures which have stirred environmentalists outside communist countries. In turn, these stirrings outside the Soviet Union have come to the attention of Russian leaders who invariably seem to feel that what is of concern to the other developed countries of the world should also be of concern in the Soviet Union.

Among the most promising indications of action on the environmental front is the announcement in March 1972 that over one billion rubles would be spent to clear up the Volga River. Similarly, the program to supply abundant quantities of natural gas to all major Soviet cities has already had a beneficial effect on the ambient air. At the same time, the government has apparently decided to close down some factories in instances of particularly severe pollution. Thus, the Leningrad Coke-Gas plant was closed down in 1972. Since natural gas supplies have been available in Leningrad since the early 1960's, presumably the coke-gas plant could have been closed much earlier, but as belated as the action is, it has made a major improvement in Leningrad's air.[20] Similar actions were taken in Riga in 1967 when a phosphate plant was closed and in Lithuania when an asphalt plant was shut down.[21] In other occasions the Voskresensk and Krasnogorsk

[20] *Izvestiia*, October 22, 1972, p. 3.
[21] *New York Times*, February 13, 1972, p. 10.

chemical plants and the Novogorky Oil Refinery were closed. Reportedly at least one hundred shop and factory units were closed down, at least temporarily, in Moscow. Further action is apparently planned for the future.[22]

The Russians are also making an effort to upgrade their pollution technology. They are doing some exploratory work on automotive emissions and have come up with the idea of controlling the flow of gasoline into the engine rather than after it has been subjected to combustion.[23] But so far there is no indication that the experiment has moved from the laboratory to the street. The Russians are also proud of the work at the Cherepovets steel mill where they attempt to recycle air as well as the water. Similarly, closed water recycling systems have been refined for an oil refinery at Riazan and at chemical complexes at Pervomaisk and Severodonetskii. A biological purification system has been introduced at the V. I. Lenin metallurgical combine at Kuznetsk.[24] These are all steps in the right direction but their limited number indicate how difficult it is to deal with the situation.

There are other things we can learn from the Russians. They have made great progress in the recycling of their sewage. Just as the Metropolitan Sanitary District Authority in Chicago is beginning to do, the Russians have for some time taken pretreated sewage effluent and applied it to the soil as fertilizer. By 1971, approximately 200,000 acres were being fertilized this way. Russian experience with such efforts could considerably reduce our own learning experience. Similarly, the Russians have had extensive experiments with centrally supplied steam for heating and hot water. Several of our public utilities also provide such services, but frequently they complain of the economic unprofitability of such operations. The Russians may be able to provide us with ways to make these procedures more economically efficient.

As promising as these efforts are, the fundamental contradictions discussed earlier have so far not been resolved. This is best illustrated by the continuing pollution of Lake Baikal, perhaps the Soviet's greatest ecological treasure. Lake Baikal is the deepest, the largest, and perhaps the most spectacular fresh water lake in the world. Nevertheless given the world-wide demand for economic growth and the lack of environmental safeguards in the Soviet system, it was only a question of time before "progress" would come to Lake Baikal. It came in the form of the industrialization of Ulan-Ude, an expanding city without sewage treatment on the major tributary of Lake Baikal. It came in the form of clear-cutting logging operations which razed the shores and interiors of timber. And finally it came in the construction of two cellulose and paper factories on the shores and along a tributary of the Lake. Even under the best of circumstances, cellulose and paper plants bring ecological destruction in their wake. Anything near Lake Baikal could not be considered the best of circumstances.

Once they learned what was to happen, local biologists and limnologists began a campaign to save the Lake. By any standards their campaign generated enormous publicity inside the Soviet Union and even outside it. Important national Soviet newspapers like *Literaturnaia Gazeta* and *Komsomolskaia Pravda* carried article after article

[22] *Sovetskaia Litva*, March 18, 1972, p. 4; *Izvestiia*, January 6, 1973, p. 2.
[23] *Sotsialisticheskaia Industriia*, September 26, 1972, p. 2.
[24] *Izvestiia*, September 20, 1972, p. 2.

describing what was happening, and urging immediate action to save the lake. The very fact that important Government and Party newspapers and officials (there were reports that even Premier Alexei Kosygin expressed his personal concern) devoted so much attention to Lake Baikal indicates the seriousness of the differences and the significance of Lake Baikal to the general Russian public. Considering that there was apparently no formal conservation group which organized, plotted, and sustained the campaign, the response was all the more remarkable. To insure that the Lake would be properly protected, the Council of Ministers of the Russian Republic passed a law in May 1960 establishing strict rules for the operation of the cellulose plants and the logging enterprises on the lake shores. However, "business continued as usual." There seems to be no evidence that the protests were having much impact. Indeed the first cellulose plant at Baikalsk started to operate in 1966–67. After renewed criticism a second law was passed in February 1969, this time by the Council of Ministers of the Soviet Union. There was no significant difference between the two laws, only that a more senior governmental authority had issued the second law. In the meantime the second cellulose plant at Selenga began to operate. Clearly this 1969 law had little more effect than the 1960 law,, so yet a third, and virtually similar law, was passed in September 1971. This time it was issued not only over the name of the Council of Ministers of the Soviet Union, but also by the Central Committee of the Communist Party of the Soviet Union. With all due respect to the Central Committee, the quality of the water in Lake Baikal continues to be degraded.

It should be made clear that the water in most of Lake Baikal still consists of some of the purest in the world. Humans can drink it and usually even the effluent from the treatment plant with absolutely no harmful effect. Moreover the treatment facilities at the Baikalsk plant are among the most elaborate in the world. Unfortunately pollution control equipment even at Lake Baikal does not always work properly.[25] And even when it does, the quality of the water discharged is of poorer quality than the lake water, and therefore slowly effects the lake's unique quality. Even if the treatment facilities are ever completely successful, indiscriminate logging operations have already destroyed the natural water regulating capacity of about one-third of Lake Baikal's basin. Published reports as recently as September 1972 indicate the deterioration of the lake is continuing. Lake Baikal's ecological balance is simply too fragile for cellulose plants and logging.

The explanation for the continued exploration and abuse of perhaps the most precious ecological treasure in the Soviet Union is, as explained earlier, the quest for economic growth. Increased production overrides all other considerations. This quest was epitomized by an article written by N. Chistiakov, the Vice Minister of the Pulp and Paper Industry and L. Kuznetsov, Chief of the Cellulose Paper and Carton Administrator of the Ministry. "We are also for preservation of the Lake, but we are also opposed to underutilizing its water and its timber." And as Chistiakov added in a discussion with me, "Don't you believe in progress?"

[25] *Izvestiia*, September 20, 1972, p. 2.

For the sake of such progress, laws can easily be manipulated to the needs of industry. When an inspector refused to certify that the treatment equipment at the cellulose and pulp plant at Baikalsk measured up to specified standards, ministry officials simply looked around elsewhere until another but less conscientious inspector was found. Thereupon he approved the treatment equipment, shortcomings and all. If such abuse takes place at the expense of Lake Baikal, it is reasonable to assume that it happens elsewhere as well.[28]

Presumably, ecological gems like Lake Baikal in the Soviet Union need not always be sacrificed for economic growth, but before this will happen, there must be changes in the pervasive attitude that economic growth above all else must come first in the Soviet Union. In addition, a centralized environmental protection agency when and if it is created in the Soviet Union must be attached to organizations with real power such as Gosplan. An independent organization with no status in the power structure will simply be ignored. But even being attached to Gosplan will be of no avail unless Gosplan officials reverse their priorities and reject their present ideology.

V. The Soviet Union and Its Environmental Relations With the Rest of the World

The only way most Americans will be affected by Soviet environmental policy will be by the Soviet sale of its natural gas. Although the construction of pipelines from the frozen interior of the Soviet Union may result in some adverse effects within the Soviet Union itself, externally the sale of large quantities of liquified natural gas to the United States will go a long way toward improving the quality of our own air.

There are also multilateral implications in Soviet environment policy. The Russians demonstrate an evident anxiousness to participate with other countries on environmental questions. In addition to the United States, the Russians have joint agreements with countries such as the United Kingdom, France and the countries bordering the Baltic Sea. To some extent politics enters into Soviet environmental considerations. Thus, the Russians boycotted the Stockholm Conference because the United Nations refused to seat the German Democratic Republic as a full participant. Now that the East Germans have been authorized to participate in United Nations organizations as an active member, there should be less reason for similar boycotts in the future.

Despite such positive moves, it cannot be automatically assumed that the Russians will always adopt a cooperative attitude on international environmental policies in the future. For example, the Russians show no evidence of halting the development and promotion of the SST. Even Soviet ecologists sometimes treat the SST as a sign of the Russians' technological prowess. Similarly Soviet engineers talk increasingly of rerouting some of their large Siberian rivers so that fresh water can be diverted from the Arctic Ocean to Central Asia and the Caspian and Aral Seas. While the Arctic Ocean may not be as international in character as the Atlantic and Pacific Oceans, the consequences of a man-made alteration in its makeup could have enormous

[28] *Sotsialisticheskaia Industriia*, September 23, 1972, p. 1; *Sovetskaia Rossiia*, July 1, 1972, p. 3; *Literaturnaia gazeta*, May 24, 1972, p. 2.

consequences for the world's climate and perhaps on the rotation of the planet itself.

VI. Conclusion

Close cooperation on environmental concerns with the Soviet Union is very much in our interests just as are such exchanges with Japan or the Common Market countries. Such arrangements can help resolve domestic complaints that the regulations in one country are unfairly rigid in comparison with those in a competitive country. Yet environmental cooperation among the great powers may frighten some of the smaller powers, especially the developing countries. There is always the possibility that collusive agreements about banning the importation of "dirty" goods may be made at the expense of the poorer countries. Presumably, however, even if the big powers gang up on the small powers, the world would still be better off with collusion than with collision and the environmental destruction that wars today can generate. An old Russian proverb has it that the grass is trampled whether the elephants dance or fight. In that case, it is just as well for the planet, that the elephants dance.

SOVIET TECHNOLOGICAL POLICY

By RAYMOND HUTCHINGS

CONTENTS

INTRODUCTION

The U.S.S.R. currently is emphasizing technological advance. This is something which the Soviet leadership always saw as extremely important. Lenin even defined the supreme goal in political-cum-technological terms: "Communism equals Soviet power plus the Electrification of the Whole Country." (Electrification has actually been the leading sector in Soviet industrialization, a more than 300-fold multiplication of electric power output having been achieved since 1917.) However, the present stress on technological progress seems unusually insistent, while current circumstances make such a stress especially appropriate.

Soviet progress in technology was effected along three main lines: dissemination of techniques already known in Russia; introduction and dissemination of techniques first developed and applied abroad; and creation of new techniques in Soviet laboratories followed by their industrial application.

The first of these directions can be traced in successive slogans which extolled electrification, mechanization or some other "ation." Characteristically a slogan was superseded rather than revoked, and

its implementation led to Russia catching up rather than overtaking the West, although at any given time a particular direction tended to be pressed beyond what was economically or technically expedient.

The second aspect comprised transfer into the Soviet Union of a wide variety of techniques spread over almost all major sectors, although at any given moment leaving substantial gaps within these sectors.[1] The Soviets had to choose between alternative processes and models, and in general seem to have chosen sensibly. The new technologies were adapted to the metric system.

The third aspect has been so far of relatively minor importance in economic affairs, but is represented in a few instances, notably manufacture of synthetic rubber. It has been much more important in Soviet military hardware and in the aerospace industries.

In the present stage the comparative prominence and relevance of these categories has shifted. Continuation of a policy of implementing slogans threatens to unbalance technological progress. Electrification is claimed still to remain the best general index of technical progress, but qualifications regarding the manner of its implementation are beginning to be admitted. The scope for transfer of foreign technology into the U.S.S.R. is possibly as great as before by some absolute measure, but has diminished in relation to the variety of technologies now being applied in the U.S.S.R. The third aspect should consequently be gaining in relative importance, especially since Soviet scientific and technical capabilities have been greatly augmented in recent decades.

Other circumstances are making technical progress more urgent and necessary, such as: the need to rely increasingly on technical progress to maintain rates of economic growth, due to actual or approaching exhaustion of *extensive* means to increase output (further enlargement of the labor force, increased capitalization, etc.); diminution of the possibility of gaining further economies of scale; and a need to cope with poorer grades of raw materials (for example, the average Fe content of iron ore extracted in the U.S.S.R. declined from 55 percent in 1940 to 38–40 percent in 1970). Moreover, following a sharp drop during the so-called Seventh Five-Year Plan (1961–65) in the period-to-period rate of increase of capital investments, the present Plan foreshadows a further small slackening in this rate.

While these are negative elements in the situation, there are also positive ones. These consist essentially in the enlarged capability of Soviet science and of the Soviet economy. The stronger economy can (if it wishes) allocate larger funds for research and development, while more numerous scientists and technologists and a more ample scientific-technical base (research institutes, laboratories, test-stands, etc.) have become available to undertake the work. A more relaxed international situation may possibly enable a larger fraction of Soviet scientific-technical effort to be devoted to civilian objectives.

To match the altered situation, Soviet policy is in turn being modified. The most concrete and comprehensive expression of policy at the present time is found in the Soviet Ninth Five-Year Plan (1971–75). Details of Soviet policy will consequently be derived mainly from this source.[2] Changes in policy can be grouped under the following headings:

[1] Transfers which are documented in considerable detail in A.C. Sutton, *Western Technology and Soviet Economic Development* (three volumes). Sutton's generalization of these results is, however, less successful: there is a tendency towards exaggeration.

[2] N. K. Baybakov (ed.), *Gosudarstrennyy pyatilctniy plan razvitiya narodnogo khozyaystva SSSR na 1971–1975 gody* (1972).

(a) The organization and functioning of research and development have been modified with the aim of eradicating identified weaknesses, and particularly in order to bridge the traditional separation between research and production.

(b) The attempt is being made to specify more precisely the areas and sectors where technological development is necessary, and the kinds of technologies which are most appropriate.

(c) Fuller and more effective access to foreign technology and know-how is being sought.

(d) The attempt is being made to construct a philosophy of technology. This will underpin theoretically the necessary practical measures and itself may in due course begin to influence directions of development.[3]

In this chapter, the main focus will be on (b). Besides describing and characterizing technological policy, we need to describe and characterize its results.

Technology can be defined as the application of science together with practical experience for economic or welfare purposes or for defense. Science influences technology, while by a feedback process technology influences science. Links can also be traced between science, technology, and design. If technology is applied successfully for economic ends, a mutually accelerating progress is potentially set off but may be interrupted by a preferential application of technology for non-economic ends or by decisions not to enlarge correspondingly the sums spent on research and development. Non-economic effects of technical progress include benefits to health and leisure as well as additions to military strength, and will be both short- and long-term. Effects on the economy take place in the relatively short period (depending on the efficiency of the mechanism for transforming success in the laboratory or test-stand into large-scale introduction and assimilation of the new processes). Longer-term benefits accrue through benefit to science or through other overspill effects (on popular habits and behavior, mitigation of harm to the environment, etc.). The complete very long-term effects of technical progress are unpredictable. Within a highly structured and conventional society such as the U.S.S.R., and if one looks ahead only seven to ten years, the side-effects should, however, be limited; in any case, this chapter primarily looks at economic *effects*.

Technological policy can be characterized by reference to the branches of industry, transport, etc., where progress is projected or by reference to the specific physical property of the technology (forging, rolling, chemical action, etc.). I shall adopt both approaches. Directions of technical progress can be described only in very general terms.

Main Directions of Technical Progress

The Ninth Five-Year Plan defined tasks of scientific and technical progress to be:

> (1) increasing the output of progressive types of product, and assimilating new highly productive capital goods and economical materials;

[3] A current dogma asserts that science has become a direct participating force in production, and that socialism is consequently superior in this respect to capitalism: e.g. L. M. Gatovskiy, *Ekonomicheskiye problemy nauchnotekhnicheskogo progressa* (1971), p. 118. This in my view largely unjustified dual belief does not find any concrete reflection in the Ninth Five-Year Plan.

(2) complex mechanization and automation of productive processes, especially through mechanization of loading-unloading, transportation and storage;

(3) introducing and extending the use of effective technological processes and equipment which reduce expenditures of labor and materials; extending multiple use of materials, and reducing losses;

(4) extending chemicalization everywhere in the economy, but especially in agriculture, machine-building, light industry and some other branches;

(5) widely applying computerized regulation with the aim of automating processes.

To examine these in turn:

(1) The number of items which have been awarded the State Quality Standard (*znak kachestva*) will increase from about 4,000 to about 15,000. In 1972 this distinction was in fact awarded to 3,212 items,[4] which numerically is well up to schedule. (It is, however, impossible to say whether the anticipated standards of quality have been achieved.) Beginning in 1972 tasks were to be set of producing and selling new items surpassing the best domestic or foreign items as regards their technical-economic indices. Twenty thousand standards are to be renovated. (Nothing has been revealed about military or space standards or about testing or certification procedures in these fields,[5] or is likely to be.) The Plan pays enhanced attention to achieving the particular qualities which are required when production processes must tolerate extremes of temperature (especially) or pressure, or must meet other exacting requirements. Research has enlarged the inequalities among variants of a given generic classification of materials; e.g., alloy and high-alloy steels. Often only particular specifications will do; for instance, vacuum steel is required for aviation and rockets.

The emphasis on quality has other dimensions, including a need for enhanced reliability which is dictated by increased complexity of functioning dependence, especially if combined with remoteness of control. High quality may be a prerequisite of larger size of production aggregates.

(2) "Over 650" measures will be taken in introducing leading technologies and in mechanizing and automating production processes. The current stress on automation follows a certain slackening in the rate of installation of automatic lines after 1968 (most automatic lines were brought into exploitation between 1959 and 1968).

(3) Installations will become yet bigger, which is expected to be important in raising labor productivity and lowering capital investments per unit of output (e.g., cracking installations in oil refining and petrochemicals; huge excavators; containerization). Larger aggregates enable available design capability to be more widely spread, and permit more economical exploitation of poorer grade ores.

The plan hopes to economize materials as well as labor. According to available data, materials savings are called for ranging from 4 to 18.6 percent, the largest being in consumption of ferrous metals. Sav-

[4] *Pravda*, 30 January 1973, p. 1.
[5] R.W. Campbell in *Soviet Studies*, April 1972, p. 598.

ings of this magnitude must be linked with major technological advances, including as regards ferrous metals production of improved assortments and a bigger output of more economical shapes ("profiles"). Similarly, savings in electric and thermal power are to be achieved in part through raising steam parameters, modifying production processes, making better use of secondary fuel resources, and switching to gas and oil-burning. Large economies of materials (timber, glass, cement, metal) are scheduled in capital construction. On fulfillment of the plan of reducing consumption of materials depends not only equilibrium of the material balance but the adequacy of the investment plan, new projects for extraction of raw materials being highly capital-intensive.

(4) The accent on chemicalization may be seen against a background of relatively slow growth in recent years of the chemical industry (between 1965 and 1969, hardly faster than engineering and metal-working). The technical layout of this industry is exceptionally complex, which has tended to make its annual and long-term plans of investment comparatively inconstant. One of the peculiarities of a chemical industry is the fact that a given final product is technically obtainable by a variety of processes and from different basic materials; the facility can be exploited only if these latter are available, and the Soviet Union with its abundant resources is fortunate in this respect. The Soviet chemical industry is in fact transferring to new and more advantageous sources. This maintains a previous trend; for example, manufacture of synthetic rubber has been fully transferred to a new material base. A completely rational layout of this industry is nevertheless extremely difficult or impossible to attain, owing to the problem of pricing (especially in Soviet circumstances, because of the absence of markets for capital goods), and a very large number of possible permutations of processes and final products.

(5) More advanced (integral schema) computers were to be produced and more than 2,000 computer centers set up. By 1975, 20 to 25 percent of the largest plants in main industrial branches will be managed automatically. (This is not a very precise forecast.) About 240 scientific-technical problems stemming from economic tasks, and envisioning more intensive and effective production, will be tackled.

In general, in the economy, the capital output ratio is expected to increase but labor productivity to rise. Capital per head (*fondovooruzhennost'*) is expected to increase by the following percentages: industry 39, agriculture 70, building 31, transport and communication 36. The raising of the capital/output ratio in the whole economy is explained by heavy investments in agriculture, which will yield fruit beyond the time-limits of the Plan. In industry the overall ratio will be unchanged, a decline in ratios in the power and oil branches being balanced by increases in other branches. Measures to combat pollution explain some increases, while extraction must cope with worsening natural conditions. In some branches the ratio will rise due to measures to improve quality and assortment which will in compensation bring economies to consuming branches. (In the past, automation has often led to increases in the capital/output ratio.)

The Plan expected to achieve 87 percent of the planned increase in industrial output through increase in labor productivity. The annual

plan results for 1972 reported achieving through this means "over 80 percent" of the increase in industrial labor productivity and three-quarters of the increase in the national income (Soviet definition).[6]

Technical Structure and Location of Capital Investments

All major economic sectors will experience a rise in the share of capital investments which consists of equipment, instruments and inventories, as compared with building. This will be especially true of electric power, oil refining, ferrous metallurgy, cellulose-paper, flour, meat and milk, and construction, whereas the contrary trend will be represented especially in machine-building and light industry owing to diversification of their production assortments (which demands a large volume of initial building) and to a need to expand auxiliary facilities. Spending on agricultural equipment will rise largely owing to building of broiler houses and livestock complexes. In railroad construction the share of equipment other than rolling stock will fall, chiefly owing to a bigger proportionate importance of construction of new railroad lines and of double-tracking. Certain increases in building are necessitated by migration of new plants eastwards, into severer climatic conditions. While the strictly economic accompaniments of an eastward migration fall outside the scope of this chapter, its technical accompaniments include the applicability of larger-size production units (predicated on exploitation of only the richer workings), and modifications of design in order to withstand extremely low temperatures.

The plan concentrates on modernizing certain branches, which continues past practice (for example, the last few years have seen a forced development of the chemical industry, radio, electronics, and production of rare earth metals).

A branchwise classification segregates individual branches of industry which in reality need to cooperate closely with each other. One of the features of the Plan is enhanced attention to such cooperation; for instance, between metalworking and machine-building. (The highest degree of unity in both manufacturing and using machines was earlier stated to have been achieved in the rocket, aviation, electronic and instrument industries, which in various respects are intended as models for all industry. These branches are predominantly of military concern.)

Technological Progress in Various Sectors of the Economy

Ferrous Metallurgy

While the USSR still possesses ample reserves of iron ore, since approximately the mid-1960's extractive conditions have worsened: rich ores comprised only 16 percent in 1968 as compared with 21.5 percent in 1960. The decisive importance in ferrous metallurgy of expenditures on materials and fuel has necessitated setting up very large enriching combines. Use of machinery of the largest size and of opencast extraction have held down unit costs of enriched ores to only slightly above that of naturally richer ore, but the still incomplete transition to poorer ores foreshadows a further slight increase in total costs.

[6] *Pravda*, 30 January 1973, p. 1.

In metalworking, technical progress involves bringing into operation larger aggregates. For instance, whereas in 1928 the largest blast furnaces had a volume of 600 m^3, currently projected furnaces will have volumes of 3,200 and 5000 m^3, which slightly reduces capital expenditures per output-ton. In steel-smelting, the average capacity of Martin furnaces more than trebled between 1928 and 1969. Capacities of oxygen converters and electric furnaces have increased and further increases are projected. An even greater enlargement of units is taking place in rolling mills. Increase in size of aggregates will continue systematically during the present Five-Year Plan, also through reconstruction of some existing furnaces. Expenditures on automation focus on rolling rather than on blast furnaces or ancillary sectors.

Half the expected growth of output of iron and steel, and smaller proportions of finished products, are to be gained from modernization and improved exploitation of existing capacities.

Raising output quality and widening its assortment will be the main directions of development of ferrous metallurgy. The most economical and deficitary types will grow at above-average rates. The number of profiles of special shapes will continue to grow. An increase of 2.8 times is scheduled in output from continuous-pouring installations.

Non-Ferrous Metallurgy

Non-ferrous metals still are deficitary items. Output of them is to grow "about 1.5 times," although indications are that the expected increase is below 50 percent. The proportion extracted by opencast methods is to rise as a result of equipment with larger excavators, trucks, etc. The watchwords are "complex" extraction (extraction of more than one metal from a given ore) and enrichment. The geographical focus of the industry will move eastwards.

Chemicals and Petrochemicals

The size of installations will be increased, especially for producing ethylene. Assortments will be widened and qualities raised, notably in consumer goods. Processes with fewer stages will be introduced and less laborious continuous processes (as in making capron thread, staple lavsan thread, viscose silk). Automatic control systems will be applied widely and new synthetics will be produced on a large scale. Output of the most advanced thermoplastics will increase at above-average rates, while outputs of synthetic resins and plastics will grow the fastest. Uninterrupted processes, a new direction in development of plastics, will reduce per unit of output capital investments (especially) and costs. Among mineral fertilisers the proportion of concentrates will increase. A big extension in tire mileage is anticipated. The larger part of capital investments will continue work on plants already being built or will widen and reconstruct existing ones. One-quarter of total investments will be east of the Urals, compared with 18 percent in the previous Plan.

The present Plan is a transitional stage in the development of the Soviet chemical industry, which will achieve full utilization of all technological processes and material streams only subsequently. It is characterized by an especially rapid increase in output of chemical equipment.

Machine Building

The branch produces through varied technologies a huge variety of items. Directions of technical progress include the creation of continuous production process systems (complexes). The size (capacity) of units is to be increased; for example, cement kilns, turbines, agglomerating machines, installations for producing sulphuric acid. Above-average growth rates are planned for instruments and automation equipment, radio and electronics, agricultural machines especially for livestock and broiler rearing, constructional and amelioration equipment, advanced metalworking and electrotechnical equipment, gas turbines, equipment for nuclear electric power stations and for the chemical and light and food industries, railroad rolling stock and motor vehicles. The proportionate share of forging-pressing machine tools will rise, which accentuates the previous trend. Output of numbered-program machine tools will grow fastest. Special equipment is to be produced for Siberia and the Far North. New types of equipment are to be produced for the railroads, including containers. A number of new items will be produced for transportation and handling: cranes, continuous reloading machines, special mechanisms.

One of the principal scheduled directions is re-equipment of the machine-building industry itself: 25–30 percent of output of metal-cutting and forging-pressing machines will replace obsolete equipment. This direction of development appears logical as the industry, despite its focal importance in the economy, has suffered dilution of per worker capital and power ratios owing to inflation of the numbers employed.[7]

Improved types of grain combines and tractors will be produced. About twenty new types of trucks will be produced, including extremely large trucks, underground-use and go-anywhere vehicles; and larger and more comfortable busses. (Motor vehicle and tractor production are already among the most technically advanced branches of Soviet heavy industry.) Production of computing equipment will rise 2.8 times, and of scientific instruments will be increased, *inter alia* for oceanographical (i.e. largely naval) purposes. Serial production of equipment for block building construction will be started. Production of fans and especially air-conditioning equipment—hitherto undeveloped sub-branches—will rise substantially, and output of large-scale cleansing equipment will expand. More than 4,250 units will be delivered for producing enamelled cutlery, and 460 for producing furniture.

Machine building is expected to enlarge the output of consumer goods not only indirectly, by delivering to other branches appropriate equipment, but directly within its own factories. Household durable goods of higher quality (for instance, refrigerators) are to be produced and a larger output of automatic washing machines, but in both cases variety will be contracted. The growth of centralized production of items used by engineering generally, such as hydraulic and pneumatic equipment, is to be accelerated. Intra-*branch technological* specialization is to be intensified. Many new processes will be introduced. The Plan pays heed to raising the efficiency of auxiliary processes, hitherto a laborious and comparatively inefficient sector.

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[7] K. I. Klimenko and Ye.V. Petrova, *Ekonomicheskaya effektivnost' tekhnicheskogo progressa v tyazheloy promyshlennosti* (1971), pp. 149–50.

The capital investment plan provides for the largest proportionate increases as compared with the previous Plan in the Ministry of Light and Food Industry (285 percent). In most other branches increases cluster at about 200 percent, but the Ministry of Electrotechnical Industry is well below average with an increase of 166 percent, which together with the relatively moderate scheduled rise (53.2 percent) in the output of this Ministry appears anomalous since in various other respects this is a leading branch.

Timber, Woodworking and Cellulose-Paper

Capital investments accent the creation of increased capacity for manufacturing wooden panels (*plity*), a continuous highly mechanized process.

Building Materials

Similarly, here chiefly large-dimension items are planned to increase: asbestos-cement board, ceramic facing tiles, wall panels. A wider assortment of glass will be produced. Wider mechanization is projected, and automated manufacture of ceramic tiles. Relatively small increments in capacities are anticipated from organizational-technical improvements, the bulk coming from sheer enlargement of facilities.

Consumer Goods

Output of equipment for the light industry will rise by 2.1 times and for the food industry by 1.9 times. Most industrial enterprises in these branches will be re-equipped.

Light Industry

Production of high quality synthetics with various desirable properties will be commenced, and more fashionable and higher quality footwear. More than half the expected increase will spring from already existing plants. (As before, this industry will work virtually right around the clock.)

Food, Meat and Milk

New large undertakings will be set up and the industry will migrate, especially eastwards. About 27,000 mechanized or automated production lines of high productivity will be introduced. Continuous processes of manufacture of dairy products using physical-chemical and biological methods will be introduced, and aseptic preserving of fruits, etc. will find a wider application. Levels of mechanization will rise, but much manual work will still be left.

Fish

Oceanic fishing has until lately received the main emphasis. Although this will continue to increase, an even faster growth of the catch from internal waterways is now projected. On the whole the industry will grow more slowly, but port and other oceanic facilities will be improved. The capital/output ratio will decline.

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Microbiology and Combined Fodder

The microbiological industry, created during the Eighth Five-Year Plan, will continue to grow during the Ninth at well above average rates. Technical progress will comprise enlargement of production units and introduction of new automatically regulated intensive processes. New strains of industrial micro-organisms will be produced using up-to-date genetic selective and molecular biological methods. In flour-milling primarily large automated elevators will be built; these with other installations will form productive complexes, thus saving capital expenditure and labor and curtailing grain movements.

Household and Cultural Goods

No general trends of technology are visible, but the technical level of particular manufactures will be raised; for instance, compressor instead of absorption refrigerators will be produced and there will be a leap in output of semi-automatic washing machines. Quantity production of television sets and other electronic equipment will be organized on a basis of transistors and integral schemes.

Local Industry

Its technical level will be raised, but no details have been provided. This branch customarily operates at lower technical levels than union industry.

Agriculture

The plan foreshadows increasing the role of science by means which will include chemicalization, amelioration, introducing high-yield hybrid seeds and complex measures for defense of vegetation against pests and diseases. In livestock rearing, fodder quality will be raised by measures already described (growth of the microbiological industry). Theoretical and experimental researches will be intensified.

Timber

This section of the Plan is substantially devoted to improving protection of forests. Particular heed is paid to detecting and countering forest fires, which must have erupted recently on a large scale. Scientific bodies must discover means for detecting fires (through infra-red techniques) and for localizing and extinguishing them. About 30 new types of machines for logging are to be created.

Transport and Communication

As regards freight, the main trend is a shifting of fuel transport from rail and river to more specialized means (pipeline) and motor vehicle. Sea transport will grow more slowly, but will become more specialized as a result of particularly large increases in deliveries of specialized cargo ships for transporting oil, ores, coal, timber, and perishable goods. The proportion of dry cargo ships will increase and there will be a growth of container traffic. New types of airliners will be brought into service including the supersonic TU-144 of similar plan-form to the Anglo-French Concorde.

Defense

While the Plan does not specify, doubtless certain trends already mentioned (automation, increase in scale, economy in manpower) will be represented also in the defense sphere.

Similarities and Differences Compared With Previous Policies

Comparison with previous plans is made more difficult by the fact that the Eighth Five-Year Plan was published only in the form of Directives. However, main directions of technical progress envisioned in the Plan resemble those followed in previous plans, such as emphasis on electrification, mechanization and automation, and on enlarging production units. As before, only the most technically advanced new equipment will be adopted. There are also significant differences, although these are probably less than the similarities. The main differences are that more attention is paid to:

(a) improving quality of production;
(b) reducing losses: economizing materials as well as labor;
(c) avoiding or reducing environmental pollution;
(d) enlarging production units, despite the now more limited scope for consequential advantage;
(e) filling gaps which had been left in technical improvement (for instance in mechanical handling, which hitherto has been a neglected area);
(f) permitting higher capital/output ratios are for the sake of lowering costs;
(g) fostering technical advance in agriculture;
(h) in some areas, reducing variety of output.

Can these differences be traced fundamentally to Soviet experience, or to that of foreign countries? It is difficult to resolve their origins because in levels of technical and economic development the USSR has drawn closer to other advanced industrial nations. The increased emphasis on "intensive" as opposed to "extensive" development reflects this convergence. The USSR conforms to current fashions in stressing environmental protection, but domestic events (fires, erosion) have reinforced this trend. The unreserved adoption of broiler farming (also following US practice, but with a very long time-lag) indicates that concern for the environment is limited. The reduction in variety of certain durable goods is purely of Soviet origin and probably indicates that preferences of the central design body (VNIITE) are being put into effect.[8] The trend towards more specialized maritime freight transportation and container traffic imitates foreign practice, indeed is overdue. The continuing increase in size of installations exploits the combination of a socialist economy which historically has been predisposed towards "gigantamania" with the availability of large natural resources and a large internal market.

Obstacles and Opportunities

The Five-Year Plan states the technical objectives, but says much less about how to reach them. Obstacles to progress in Soviet conditions

[8] These preferences, and their theoretical and organizational background, are documented in my forthcoming *Soviet Emerging Synthesis: Science, Technique, Design.*

have included the organizational gap between experiment and production, the very small proportion of scientists employed in industry, academic tradition, and lack of material incentives to enterprises to make technical improvements, especially when these are confronted by rigidity in the production plan. These obstacles are less formidable now than they were, thanks to a decree announced in October 1968 and subsequent changes. Whereas at end 1959 only 1.7 percent of Soviet scientists worked directly in industrial plants, the situation has been changed, perhaps radically, with the inclusion of scientific-branch institutions within economic accounting productive and other associations. The restoration of the ministerial system in October 1965, which reinstated structural conditions permitting nation-wide adoption of particular technological policies, has been of major importance. Yet effective exploitation of available technology is likely to continue to be somewhat hampered by organizational, and especially security, barriers.

Whereas up to about 1965 the proportion of Soviet scientists belonging to the technical sciences was increasing, subsequently this proportion declined slightly. The dip approximately coincided with the ministerial reorganization as well as with a slackening in the rate of growth of expenditures on science and de-escalation of the Soviet space program, so may have reflected a response to altered objectives as much as any reduced capability to continue to enlarge the proportion of technologists.

The U.S.S.R. is striving to achieve a widespread advance towards various qualitative technical goals which include production without defects, reliability, continuity of process, precision in manufacture, intensivity, growth of process unity, prefabrication.[9] Certain of these goals (continuity of process, prefabrication) are not new, whereas others (production without defects, reliability) have become prominent during the past five years. Growth of process unity of producing and consuming branches is the latest resource. This is a promising direction of development, but organizationally a very complex one to achieve.

Judging by past experience, major advances in Soviet technology are likely to continue to depend on introduction from abroad much more than on innovation at home. What is the outlook for such transfers?

Foreign trade is the main gateway, and its extent and direction a major influence on the scale and origin of such transfers, especially if effected through installation of complete or almost complete plants. Soviet prospects in foreign trade depend on factors which are only partly under Soviet control. Doctrinal decks have been cleared; necessary agencies were created some time ago. Japan's effective use of the purchase of foreign licenses has been particularly noted.[10] Judging by Japanese experience, the U.S.S.R. by purchasing foreign licenses will economize in educational expenditures, thus freeing resources for research. Soviet trade with the United States (now as in the past a main source of new technology) has risen rapidly of late, and prospects for further development following the signature in 1972 of a trade agreement seem good. However, Soviet needs for foreign technology have

[9] This is based partly on Klimenko and Petrova, *op. cit.*, p. 161.
[10] E.g., A. I. Notkin (ed.) *Faktory ekonomicheskogo razvitiya SSSR* (1970), p. 57.

always outstripped her capacity to pay for or absorb it, and this situation is unlikely to alter. As in 1964 and 1972 the U.S.S.R. may be obliged to make heavy and unexpected purchases of foodstuffs, and against such an eventuality must maintain precautionary gold or foreign exchange reserves. Technological imports will nevertheless retain a high priority.

Relative to the United States or to any other country where non-defense-oriented research must eventually justify itself on commercial grounds, the Soviet Union commands the important advantage from a purely technical viewpoint that it can pursue a particular technical course for its own sake, or for the sake of possible but undefined ultimate benefits. If, as seems possible at the moment of writing, the Soviet Union achieves a monopoly in quantity production of supersonic airliners, this advantage will be dramatically highlighted.

The doubtless realistic expectation of a rise in the capital output ratio implies a reduction in investment effectiveness and thus accentuates the burden on the national resources by comparison with a more effective program. Previous plans have usually not completely fulfilled their investment programs. One can anticipate continuing tautness in the implementation of the present program; moreover, current circumstances differ from those of previous plan-periods in that surplus labor-power cannot make up any deficiency in fulfillment of the investment plan.

Motivations of Technical Progress

Technological progress often serves an economic purpose, but also other goals. The mix is variable at any particular moment only within limits, and is perhaps especially inflexible in Soviet circumstances owing to rigid internal security barriers, which restrain spin-off from military to civilian purposes. In the past, Soviet technical development has often been designed to serve scientific (including military) rather than economic purposes. An example is the development of computers in the Soviet Union.[11] The Five-Year Plan being of *economic* development naturally does not provide an adequate reflection of these other aspects.

The tendency to stress more heavily technological development for economic purposes is potentially reinforced by trends towards international détente (the signature of a SALT agreement with the United States, the U.S. rapprochement with Communist China, the ending of U.S. involvement in the Vietnam war). While these circumstances probably encourage the Soviet leaders to believe that they may devote more resources to economic development as opposed to military strength, other signs depict a continued buildup of the latter which is, no doubt, a preoccupation of the Soviet military-industrial complex.[12]

The Russians are very conscious of the interaction of technology and science and of their joint importance as factors for bringing about higher living standards. A "scientific-technical revolution" is very frequently referred to in Soviet literature. The triangle science, technique, production is seen as the invariable basis of technical progress.

[11] Richard W. Judy in S. Wasowski (ed.), *East-West Trade and the Technology Gap, A Political and Economic Appraisal* (1970), pp. 70–1.

[12] The characteristics of which are presumed to be as suggested in my *Soviet Economic Development*, p. 29, footnote 8.

Even if awarding primacy in the near future to economic purposes in technical development, they will consequently by no means neglect its wider repercussions. (A record projected ministerial increase (+120.7 percent) in output of the instrument-building industry supports this proposition.) Soviet preoccupation with social problems continues to be far less than American, which enables Soviet research to be more largely devoted to the less intractable problems of technological development.

In the electrotechnical industry, which is important for accelerating scientific progress and for strengthening the link between science and technique, a number of scientific-production associations have been set up, and a new system of planning has been introduced. The experiment is being extended to several other branches.

In the U.S.S.R. a few years ago the question of the comparative effectiveness of scientific and capital expenditure on raising output was keenly controversial. Protagonists of science claimed that scientific expenditure was three to four times more effective than capital expenditure. The more extreme claims of relative advantage for expenditure on science seem now to have been discarded.[13] Relative to other claimants on budget generosity, science seems to have reached a *modus vivendi* on the basis of absorbing a stable proportion (about 11½ percent) of expenditures of Social and Cultural Measures. The Ninth Five-Year Plan maintains the post-1965 policy of raising expenditure on science and technique not extremely rapidly (by "over 60 percent as compared with an expected increase in the national income of 38.6 percent").

Measures of Effects of Technical Progress

Technical advance made in any particular appliance or machine may be measured by its resulting gain performance; e.g, speed of rotation, output of finished product. Since as a rule an organizational adjustment is simultaneously required, Soviet sources customarily refer to "technical-organizational effect." The total effect becomes more difficult to measure, the more extensively distributed the sphere of technical progress, as this entails more complicated and interrelated changes in work and consumption patterns.

Judging by fragmentary data, during the present plan-period the largest proportionate increases in output will tend to occur in branches where technical-organizational measures will assure the largest percentage of the expected increase in output. Thus, large increases are planned in machinebuilding, where the share of technical-organizational measures is to be 50 percent, but a smaller increase in the catch of fish where the share will be "at least 20 percent." The Soviet Union in effect continues to show the reluctance to alter markedly the sectoral distribution of capital investments which has been one of the hallmarks of her economic development.[14]

There is no unique or completely acceptable way of measuring technical progress, which normally occurs simultaneously and interdependently with alterations in quantities and qualities of labor and in the quantity of capital: technical change is embodied in new capital,

[13] See V. A. Zhamin, *Nauka i ekonomika sotsializma* (1971), pp. 235–6.
[14] The relatively static distribution over time is illustrated in table 19 in Raymond Hutchings, *Soviet Economic Development* (p. 205).

the efficient exploitation of which requires an appropriate adjustment in labor skills and in the number of personnel employed. Where technical progress is postulated, it is estimated by Western economists as a residual after allowing for additions to labor and capital. Growth of productivity due to technical progress is usually assumed to be exponential (a constant rate per annum). Analyses of particular Western countries have arrived at increases of 0.7, 1.2 or 1.5 percent per annum.[15]

The available very limited data concerning increases in output to be expected during the Ninth Five-Year Plan as a result of technical progress offer little scope for comparison with these results. Where some comparison is possible (as in fish, cement, asbestos-cement tiles and window glass) the implied annual growth of productivity over the five-year period due to technical progress ranges from 0.7 to 1.6 percent, and so is of quite similar magnitude as results previously obtained for sectors of particular Western economies. Extrapolation of this similarity to shed light on the general technical feasibility of the Soviet Plan is a dubious procedure, but at least the main lines of its technical provisions will probably prove to be realizable.

Consistently with such a conclusion, most features suggest that technical progress will be more effective than in previous plan periods:

(a) Efforts are being made to fill gaps in technological processes, as in mechanical handling.

(b) More attention is being paid to technical links between branches, for instance that metalworking should produce shapes adapted for machine building.

(c) Directions of technical development have been worked out in greater detail.

(d) Considerable attention has been paid to shedding light on the economic effectiveness of technical progress, and something nearer to a consensus seems to prevail now regarding its amplitude.

(e) A better balance has been achieved between relative levels of development of science, technology and design.

(f) Relatively more attention can probably be paid to economic as compared with non-economic objectives.

(g) However, increased specialization (e.g. in transportation) while increasing efficiency will slightly reduce flexibility in the economy.

The sectoral distribution of technical improvements encompasses branches of differing degrees of self-sufficiency and gestation periods, from machine-building itself at one extreme to equipment for the light and food industries at the other. As regards comparative levels of technical development, one can choose various cross-sections. The intention seems to be to narrow down the differences as between Group A and Group B (production of capital goods and production of consumer goods) by means of raising the latter's relative level. An examination of the cross-section all-union/union/local industry would possibly uncover an accentuation of the technical supremacy of the two former. Regionally, zones east of the Urals will make relative gains. Agriculture is intended to score some gains by comparison with industry. As

[15] C.E.V. Leser, *Econometric Techniques and Problems* (1966), pp. 71–2. It is not implied that the impact of technical change will actually be at a constant rate per annum. A deliberate pattern of introduction of new processes which a planned economy can potentially adopt may make the rate of progress more uneven.

between manufacture and services, the latter will gain especially in the sphere of transportation. On the whole, there will be a significant evening-up of technical levels in the various sectors of the economy.

Although updating its technical visage, the U.S.S.R. will continue to be rather insensitive to fashion trends and unresponsive to radical shifts in life-styles, but this insensitivity removes a bar to technical development along lines which stress quantity and technical efficiency, directions which are suitable for an industrializing society rather than the post-industrial society which the U.S.S.R. has not yet become. On the whole the chosen directions of technical progress seem to conform well with current economic objectives, and they should make a large contribution towards reaching these objectives.

INSIGHTS FROM EMIGRÉS AND SOCIOLOGICAL STUDIES ON THE SOVIET ECONOMY [1]

By ZEV KATZ

CONTENTS

INTRODUCTION

Emigré reports have often been downgraded in the past as accurate indications of developments in the Soviet Union when the reports were at variance with officially presented conditions and the emigré sample could be dismissed as unrepresentative, too small, or biased. As a result we did not appreciate either the extent of the camp system or the Great Purges, the loss of life in Leningrad and the U.S.S.R. as a whole during World War II, the grain shortage during the war, and the anti-Stalinist sentiment among the Soviet populace. The emigré interview project in the 1950's involving the Russian Research Center of Harvard and Russian Institute of Columbia provided many additional insights which were in time accepted.

[1] The second section of this paper draws heavily on research published by the Center for International Studies of the Massachusetts Institute of Technology under contract with the United States Information Agency (USIA). This relationship does not include endorsement by the USIA of this study, nor should the contents be considered as reflecting the official position of the USIA. The views expressed herein are the sole responsibility of the author.

Now there is a new, albeit small, emigration—especially of Soviet Jews to Israel. Another opportunity presents itself to see Soviet society from a different viewpoint than that of the often crooked official mirror. Some questions that were of interest to Western economists in interviews of the World War II emigrés have been put to the current group, e.g.:

1. Is there a distinction between the official, formal, economy and the unofficial, informal, quasi-private economy?
2. Do Soviet economic statistics accurately measure the production and consumption of goods and services?
3. Is central planning an objective elaboration of Soviet leadership's policies and preferences or a process of compromise among conflicting elite interest groups?

Certainly no definitive answers can be provided from emigré interviews by the author to date but some useful insights appear to be possible.

The first section of this paper is based on talks and in-depth interviews with several hundred emigrés from the Soviet Union in the period since 1967 conducted by the author in Austria, West Germany, Israel, the United Kingdom, and the United States. The evidence from non-Jews was not significantly different from that provided by those of Jewish extraction. Though the sample can by no means be claimed to be representative of the Soviet population as a whole, the insights provided may be useful in calling attention to otherwise undetected developments and be helpful in assisting the design of future studies.

The second section of this chapter deals with sociological insights from research based primarily on Soviet publications. Western and Soviet economists and sociologists alike have examined evidence to answer the following questions:

1. What is the structure of Soviet society? What are the criteria for differentiation in this social structure?
2. Is Soviet society moving toward a classless or elitist social structure?
3. Is Soviet society moving toward egalitarianism in the distribution of power and income?

No definitive answers are possible on the above questions, but insights from Soviet research are illuminating.

I. Some Observations on the Soviet Economy Resulting From Talks With Recent Soviet Emigrés

Following are some observations on the Soviet economy generated by this writer during talks with Soviet emigres in the last few years in Europe, Israel and the United States. The most recent talks (often long, in-depth interviews) were conducted during a four-week visit to Israel and Germany in January and February 1973, and a series of visits to the Transit Center for Emigrés, near Vienna, Austria, in September 1972.

Since no systematic interviewing is possible at present, these talks can by no means be regarded as reflecting opinions of a rigorously selected representative sample. Rather, these are personal remarks following talks with people who could offer insights into the operation of the Soviet system and relate information and unique experiences in as objective a way as possible.

A. The Operations of the Soviet Economy: The Interlocking of the Official and Unofficial "Sectors"

The cumulative impact of the evidence presented by the emigrés leads to the following overall conclusion:

The Soviet economy *today* is by no means as much a *command economy* as Western specialists are led to believe by the "official" information about the Soviet Union and the Western notions of the "totalitarian" system. Rather, its viability and relative success are a result of it being a "mixed economy," including at the two opposite poles a command-economy part and a semi NEP-type economy,[2] While based on private operation and profit, the later is by no means a typically capitalist economy, since its "means of production" are mostly publicly owned. Much of this NEP-type economy operates through the utilization of state and cooperative property in combination with small-scale private property to produce private gain. Between the two extremes there are all kinds of shadings of intermediary forms combining some elements of both systems: public ownership, some planning and control from above, management by appointees of public bodies—as well as the motives of profit and personal gain, private management, catering to group interests, orientation on the market, and market prices.

The command economy is able to concentrate so heavily on regime-selected targets and to be successful not despite the private-NEP economy, but rather because the latter takes care of many needs not provided for (fully or partly) by the command economy. It frees the command economy from the burden of many tasks which, had they been entirely uncatered to, could have caused serious breakdowns in the Soviet system.

In official terms, it is possible to classify the sectors of the Soviet economy as "legitimate," "black market" and "grey market," with the latter category denoting an immense area of operations between the two extremes. The legitimate economy encompasses not only the publicly owned and operated categories; it also includes the small-scale private economy which is entirely legal, such as the "household plot," the privately operating craftsmen, professionals, tutors and repairmen and the food and second-hand goods markets and bazaars. The grey market includes those operations which, while not entirely legal, are conducted with the knowledge and (semi-official or private) cooperation of officials. Such operations are not actively combated by law enforcement authorities, nor are they at present a target of much "hate propaganda" by the official media and Party propagandists.

For example, by official theory, the peasant food markets exist only to allow peasants to sell the surplus from their private plot. Collective farms and cooperatives also are allowed to sell some of their surplus produce when cleared through special arrangements. In actual fact, many of the stalls at the markets supposedly owned by "cooperatives" or by "peasant sellers" are actually owned by private operators (individuals and groups) working on a "professional" basis. Often supplies are brought by truck, railways, and even airplanes from faraway areas. The trade is run by well-organized, intimate groups who enjoy

[2] The New Economic Policy (NEP), instituted in Soviet Russia in the 1920s consisted of a partial decentralization of economic decision-making and legalization of small-scale private economic activities.

semi-legal cooperation by the officials of the markets, the transportation networks, the farms and workshops connected with it. Such officials get remuneration in various forms, from services and favors to a straight "cut" of the profits. According to the emigrés, such operations are all-pervasive and well known to all officials, including the Party leaders. In this kind of operation, almost all is conducted quite legally; though private payments to officials are illegal, they are done in ways which provide a garb of legality (e.g., by getting scarce foodstuffs, spare-parts or even a car for him at official prices, much below the "free" black market prices, etc.). In many cases, this remuneration includes services needed for the fulfillment of the production plan of the factory, thus oiling the rusty parts of the Soviet bureaucratic economy.

This NEP economy has developed especially since the fall of Khrushchev and the end of the economic trials of "speculators". The post-Khrushchev leadership stopped these trials, abolished the death penalty for economic crimes, introduced several concessions for private "household plot" economy, and encouraged the peasant market. It also introduced some measure of economic reform, with the profit rate as a formal indicator of success and plan fulfilment. It put a greater stress on the production of consumer goods, inducing enterprises in heavy industry to produce refrigerators, washing machines, radio and television sets, etc. It encouraged the cooperative and state farms to specialize and develop subsidiary farms and industries.

Though the reform has been curtailed and there has been a renewed tendency to recentralization, it apparently opened up possibilities for the grey market mentioned above. To a considerable degree, local enterprises and officials can decide on various matters and do things they could not do before. Since the managers of a factory or an enterprise can now set up new lines of production (whether refrigerators or chairs) on their own initiative, they are able to do part of it so as to gain benefits for their organization—and for themselves. The emigrés argue that in this matter there is often a meeting of interests of the enterprise, the managers, the private operators, as well as of the local leaders—since these additional lines of production help to fulfill the plan and simultaneously provide them with private gain.

B. Statistics About the Official and Unofficial Economy

The emigrés give varying estimates about the dimensions of the "unofficial" economy. Some argue that it amounts to fully one half of the official economy or more; others say it amounts to between 10–25 percent. Obviously, no reliable estimate is possible.

Naturally, the most persuasive evidence comes from recent emigrés from Georgia. "In the U.S.S.R. nobody lives on his official wages, everybody must find some way to turn his official work station into a means for additional income—otherwise he will not be able to live"—this comment was repeated again and again. Private operators ship goods by truck, train, and even by chartered planes as far as Moscow, Leningrad, the Urals and the big cities in distant Siberia. On their way back the vehicles pick up loads that are in short supply in Georgia. Part of the material goes to enterprises which made the trip possible, and part is sold at "free market" prices as gains for the operators, with the officials getting their share.

Is this phenomenon peculiar to Georgia alone? Almost invariably the emigrés argue that this is applicable to the whole of the Soviet Union. There are some differences as to dimensions, forms, openness and blatancy of operations, but basically the unofficial economy is a general and all pervasive phenomenon. It creates a situation in which almost everybody has work in two parallel positions. A woman hairdresser from Minsk explained that she worked in "her" little hairdressing shop in one of the major hotels as if it were her own shop: she arranged appointments with her clients and then she paid into the official cash register the necessary sum and the rest was her own ("two rubles to the state, three rubles for me"). She worked more than the official hours and, being a highly skilled and industrious person, she overfulfilled her obligatory plan by a wide margin; she also gave higher echelon officials their "cut." A driver told stories about far-ranging trips of trucks in major columns for private contractors. "I could not really believe that it is being done on such a major scale until the publication of a decision by the Central Committee of the Georgian Communist Party." A student from Moscow, who happened to live in the same house in which a research organization was located, repaired the heating system in the midst of winter when no plumber could be found. He was soon induced to accept a (fictitious) position as "chief plumber" in the organization. He went on with his studies and life as usual. As long as he could be reached whenever necessary to rush back home and repair the heating system when it broke down, his salary and position were secure. When he graduated, he was given the title of "heating systems engineer" at the research organization, so that he would not leave. He worked at another job and regularly collected his two salaries. A seamstress from the Ukraine used to live-in with elite families and sew for the women of Party bosses and private operators alike. A teacher of mathematics from Riga used to earn a few times his official salary by tutoring youngsters for their college-entrance exams. Several families in Samarkand worked at home producing leather goods for the bazaar. A young engineer from the south of Russia participated in an informal housing repair enterprise. They were able to get all the scarce equipment not available through formal channels. Another engineer from Kharkov worked at home with his father in watch repairs. This line was much more profitable than his job. Three brothers from Moldavia ran an unofficial private car repair business. And so on.

This "unofficial" economy may serve as an explanation for several phenomena in Soviet reality which are otherwise difficult to understand. It may have been a contributing factor to the lack of success of the economic reform. The basic assumption of the reform was that linking wages and salaries to profitability of enterprises would motivate the employed to work harder and more efficiently. But the actual bonuses generated as a result of such profitability of enterprises were much too small in comparison with the substantial incomes possible as a result of grey and black market "side-line operations." A salesgirl from Chernovtsy explained: "Why bother to earn an additional 25 percent on my official salary of 80 rubles a month when I could get the same amount as a 'tip' by selling one expensive coat in scarce supply to a private customer."

Some of the emigré families, though working in simple occupations, seemed to have been very well off when in Russia. One family of a humble official of six persons, was well dressed, lived in a four-room flat, and brought out of the Soviet Union fine furniture, a refrigerator, an electric stove, a washing machine, some jewelry. The children went to college, the wife did not have to go to work. When asked how he was able to manage, he answered quietly: "Well, I worked in an important supply organization."

The emigrés almost uniformly report that during the sixties, wages and incomes have risen, and that prices have also risen considerably. Why was there no dissatisfaction about it? Because, whatever the possible rise in official wages may be, it cannot solve the problems of the family budget. Therefore the people concentrate on finding ways for an additional income which gives them a significant effect. One emigré, a clerk by profession, told me that he lived in a house of 16 rooms altogether. At first I did not believe him. Then others corroborated his story. It turned out he lived along the Black Sea shore and had a large family. Every year during season-time, the family moved out to live in an out-house. The main house itself was rented privately to holiday makers from the big northern cities. The whole family worked in the unofficial hotel, cooking, doing the washing for the guests and looking after their children. The enterprise must have been profitable: every year new additions were made to the house.

The unofficial economy may also explain the rapid growth in savings in the savings banks, far beyond what seems reasonably generated from the official wage-hikes. It may also account for the inflation in prices at the food markets. Otherwise, how can Ivan Ivanovich afford tomatoes at $1.00 a pound or a small chicken for $5.00 when his total average net income a month is about $100.00? And how can the expensive luxury restaurants in Moscow or Riga be frequented by any Soviet citizen, when the price of a meal for a family is equal to a two-week salary of a professional person?

As to official statistics, many of the emigrés warn against accepting them at their face value. Only a few argue that they are consciously and outright falsified. Others think that they are manipulated and selective, representing only some facets of the real situation. Some emigrés report having seen or heard about special classified statistical publications. These include a "secret statistical yearbook" produced in 400 copies and delivered through special couriers to selected officials. Each copy is numbered and kept in closed safes. The "yearbook" apparently includes statistics not released in the official publications (presumably reflecting the Soviet defense effort) as well as figures about underfullment of plans, calculations which do not show the Soviet economy in a positive enough light, realistic statistics comparing the USSR with non-Communist powers.

The emigrés report that the overall Soviet figures should be discounted by a certain percentage because of the so-called "*pripiski*" ("in writing") of fictitious amounts. This is apparently a rather widespread custom, a game played all along the line because all are interested in keeping it going—from the actual producer to management and the top leaders.

The principle is that a certain fictitious amount is added to any real amount produced or shipped. All necessary paper work is done as if the missing amount is actually there, and the proper signatures are

attached. But isn't it found out in the end, since the fictitious material is after all not there? The emigrés answer that, paradoxically, this is not easy to find out: there are all kinds of allowances for "spoilage during transit," for drying up, for lost materials. Many supplies wander a long time between one destination and another. Until it is discovered that something is missing, until a document is drafted and sent to the proper addresses, and until an investigation is underway—much time is lost and it is difficult to establish what really had happened. Besides, those indulging in the game know the Soviet system of accounting and arrange things in appropriate ways. Also, as mentioned above, the investigating officials often have a vested interest not to discover the true situation. After all, didn't they report about fulfilment of the plan (which included the fictitious additions) ahead of time and didn't they get their decorations and bonuses for it?

It would seem, therefore, that all Soviet official statistics are in need of two sets of corrections: deduction of a certain percentage of "fictitious in-writing" and adding a certain percentage for the unreported fruits of work of the unofficial economy. What the ultimate net balance may be and whether the official statistics need to be upgraded or downgraded in order to arrive at a more accurate estimate of the Soviet GNP—much more precise information is needed before an answer to this question can be tackled.

C. Planning

The emigré evidence suggests that planning in the U.S.S.R. may not be as rationally and centrally determined as it may seem from the outside. In many instances there is a lot of interest pushing and infighting around the plan. "The most important thing for anybody in the Soviet Union is what kind of plan he is going to get for the next year * * *. Much of the effort during the whole preceding year is going into this. At the chemical industries in which I was working as an accountant, we labored much ahead of time to prepare calculations which would demonstrate points to our advantage and assure us a better plan", one emigre reported. When a new line of production was to be introduced at their organization the planning department prepared seven versions of a plan before the various interests could be accommodated. "We do not need an objective plan or an economically perfect plan" the top manager used to say. "What we need is a plan which we can comfortably fulfill and overfulfill. * * *"

Enterprises and organizations often send special representatives to Moscow and wherever necessary, to argue, lobby, press, cajole, and bribe in order to get desired plans or supplies. Often national interests intermix with economic interests to produce an unusual cross-pattern of pressures. The Latvians are reported to do everything possible to prevent planning of new large-scale industries in the republic, whereas the Ukrainians are launching a major campaign to get more of them. The Latvians oppose it because it usually means an influx of more Russians and other foreigners and creating more islands in their territory which are directly managed by Moscow. The Ukrainians want them because they want to arrest the outflow of their labor force to work in other republics. Both cannot argue their cases openly, so they devise ingenious economic theories and calculations to justify their position. The Latvians argue in the name of technical efficiency and

progress. Instead of planning new industries, they presented a plan for the complete re-equipping of their industries with new technology, a process which will bring better pay to the already existing and predominantly Latvian labor force. The Ukrainians present calculations showing that many resources in their area are under-utilized and that they are being discriminated against in investments. The Armenians press for industries of a certain type and oppose other types. Recent emigrés from Armenia told in detail a story how they "conspired" to wrest a decision from the planning authorities to build a large electronics factory in the south of their country. The new factory gave employment to a thousand skilled people in that town, almost all Armenian, thus preventing their outflow and the threat of an Azeri majority there. The emigrés say that their are similar wrangles at planning sessions of the highest bodies, but they could not offer first person evidence about it.

II. Insights From Soviet Sociological Research on Soviet Society

Selected analysis from a series of research monographs will be provided to throw light on the questions on Soviet society, social structure, and differentiation posed in the introduction. References to these monographs are noted in each case. A selective bibliography of major Soviet sources is provided at the end of the section.

A. Soviet Social Structure, the Criteria for Differentiation

The basic goal of the Bolshevik revolution was to create a new society with a hitherto non-existent homogeneous social structure. Official Soviet theory maintains that Soviet society, though not yet classless, is composed of two friendly (non-antagonistic) classes—workers and collective farmers—and an additional stratum, the intelligentsia. Moreover, the differences that continue to exist between these social groups are deemed to be subject to a constant process of erosion. Soviet society was seen as constantly moving from a complex to an ever simpler structure. Until recently Soviet social scientists have consistently ignored the sociological theories about stratification and differentiation; they regarded social structure only in limited terms of macro-structure (classes) as interpreted during the Stalinist period. However, with the rebirth of sociology in the U.S.S.R. in the last few years, a debate about social structure began among Soviet theorists. Much of this debate questions the official image of Soviet society and attempts to use more sophisticated terms of social stratification. Some Soviet sociologists, engaged in realistic research and analysis of their society, find it to be highly differentiated and complex. Soviet writers, naturally, work under certain constraints. When they attempt to describe reality within the framework of the official doctrine, they sometimes resort to Aesopian language and, as befits scholars, their style is scholastic. Quite frequently, they merely indicate the line of their argument without corroborating it further, or leave out whole areas that are taboo.

However, knowledge about this debate on social structure in the U.S.S.R. is of considerable importance. It relates to a crucial point of official doctrine. It describes what the social groups are of which Soviet sociologists are conscious when dealing with their own society. The debate gives some idea about how the Soviet people themselves think

and talk about the groups in Soviet society and with which groups Soviet citizens consciously identify. This paper also makes a critical analysis of Soviet official theory, taking as a point of departure the criticism voiced by the Soviet specialists themselves, and adding some new dimensions which they omitted.

In the course of the debate, Soviet social theorists, perhaps for the first time, have addressed themselves to such problems as the basic concepts of social structure, the character of the Soviet intelligentsia, the problem of the existence of a ruling group or of the working class in Soviet society, and future trends in social mobility.

The official theory about the structure of Soviet society is incorporated in a conspicuous way in the fundamental Party and state documents. The U.S.S.R. Constitution adopted in 1936 begins with a chapter entitled "The Social Structure." Article I states: "The Union of Soviet Socialist Republics is a socialist state of workers and peasants." However, Article 126, which sets out the role of the Party, uses a wider description: "The most active and conscious citizens in the ranks of the *working class*, the *toiling peasantry*, and the laboring *intelligentsia* are voluntarily united in the CPSU." Articles 2 to 12 relate to forms of ownership and conditions of work in the Soviet state. They stress "the abolition of private ownership of the instruments and means of production" (Article 4) and authorize only two forms of socialist ownership—state ownership and "cooperative and collective farm ownership" (Article 5). Further articles, however, provide that "collective farm households" may have a small household-plot farm of their own, Article 7) and state that "the law shall permit the small-scale *private* economy of *individual* peasants and handicraftsmen based on personal labor and precluding the exploitation of the labor of others" (Article 9). Furthermore, "the right to inherit personal ownership of citizens shall be protected by law" (Article 11). It is declared that "labor in the U.S.S.R. shall be an obligation and a matter of honor for every able-bodied citizen." Finally, "the principle of socialism" is asserted: "From each according to his ability, to each according to his labor" (Article 12).

The term "class" is coupled only with "workers," as if there were only one class in the U.S.S.R. Both the peasantry and the intelligentsia are described by the similar terms, "toiling" and "laboring." On the other hand, the Constitution expressly allows the existence of "*individual* peasants and craftsmen" as well as inheritance of "personal property." Under the Constitution, a substantial social class of small-scale private peasants and craftsmen (somewhat similar to that in Poland) could have been a reality in the U.S.S.R. There remains a contradiction, however, since the individual peasants, craftsmen, and kolkhozniki have the right privately to own and inherit "means of production" (Articles 7, 9, 10), a relationship supposedly abolished by Article 4.

The Party Rules adopted in 1961 also open with a statement on social structure. They speak of the "working class, collective-farm peasantry, and intelligentsia."

A rather simple and brief explanation is given in the 1961 Party Program, the basic authoritative document in the U.S.S.R.

> Socialism has solved a great social problem. It has abolished the exploiting classes and the causes engendering the exploitation of man by man. There are now two friendly classes in the U.S.S.R.—the working class and the peasantry.

And these classes, furthermore, have changed. The common character of the two forms of socialist property [state and cooperative] has brought the working class and the collective-farm peasantry close together; it has strengthened their alliance and made their friendship indestructible. A new intelligentsia, coming from the people and devoted to socialism, has emerged. The one-time antithesis between town and countryside, between labor by hand and by brain has been abolished. The indestructible socio-political and ideological unity of the Soviet people has been built on the basis of the common vital interests of the workers, peasants, and intellectuals.

The program goes on to state that in the future all social distinctions between town and country will disappear, as well as those between physical and mental labor. Thus, classes will no longer exist, and the intelligentsia will cease to be a distinct stratum. This process is said to lead to a situation of equality for all in both the economic sphere (in terms of conditions of work and of reward and consumption) and the political sphere (where all will participate in the management of society). Thus, personal and public interests will coincide harmoniously.

Official statistics in the Soviet Union have traditionally treated social structure in a rather crude conservative manner. Soviet sociologists are sharp critics of this attitude of the statistical agencies.

Statistics should first of all capture the realities in social relations * * * The statistics, however, are usually behind [social] developments. It was so before the Revolution * * * and after it * * *. They were backward also in the period of building socialism; how far this went can best be seen by their state today. The same [undifferentiated] data about the class composition of the U.S.S.R. population wander from one publication to another. The population is divided into the following social groups:

(1) workers and employees [*rabochiye i sluzhashchiye*].
(2) kolkhoz-peasantry and artisans in cooperatives,
(3) individual peasants and independents artisans,
(4) bourgeoisie, landlords, merchants, and kulaks.

In a society in which all the latter [under (3) and (4)] had practically disappeared, such a table, in the best case, may have a historical significance. As to what concerns actual present-day social processes—this table misrepresents things completely. Under the column "workers and employees," all those working in the state sector are included, beginning with government ministers and ending with an unskilled day laborer * * *. such a presentation is an anachronism. * * * Clearly social structure cannot be reduced to such a "primitive" classification of society.

A typical table of the kind under attack here is Figure 1, taken from the 1968 statistical yearbook. Arutyunyan, who is the author of the above critical passage which attacks the failure to make such distinctions, quotes the official Party monthly, *Kommunist*, to support his case. He demands the official statistics should reflect "not only interclass but also intra-class relations." In the absence of such data, many a Soviet specialist has had to make devious calculations to arrive at the separate figures for workers and employees.

FIGURE 1.—CLASS STRUCTURE OF THE POPULATION
[In percentages]

	1913	1928	1939	1959	1969
1. Workers and employees [State employed]	17.0	17.6	50.2	68.3	78.4
2. Collective farmers and craftsmen in cooperatives [members of cooperatives]		2.9	47.2	31.4	21.6
3. Individual peasants and independent artisans [self-employed]	66.7	74.9	2.6	0.3	0.3
4. Bourgeoisie, landlords, merchants, and well-to-do farmers [the exploiters]	16.3	4.6			

Note: The whole population is included—dependents are assigned in accord with the status of the head of the family.

Sources: Nar. khoz. 1968, p. 35; SSSR v tsifrakh v 1970 godu, p. 23.

Despite its limitations, Figure 1 does show the main revolutionary transformations of the social structure in the Soviet Union. The "exploiters" category has been completely (and, in many cases, physically) liquidated. The self-employed in the private sector, who were about two-thirds of the population in 1913, have disappeared—at least formally. Between 1928 and the present, a kind of interchange of relative positions occurred between the workers and the farmer-craftsmen. The farmers and craftsmen, who were three-quarters of the population in 1928, are now about one-fifth. The workers and employees, who were less than one-fifth in 1928, have become more than three-quarters of the population. However, how that three-quarters breaks down between workers (blue collar) and employees (non-manuals) is not normally reported.

On the basis of statistical data in various Soviet sources, the number and proportion of the main official social groups among the *working* population can be calculated as follows.

FIGURE 2.—OFFICIALLY RECOGNIZED SOCIAL GROUPS IN THE PUBLIC LABOR FORCE, YEARLY AVERAGE– 1969

	Million	Percentage of total
Workers (all manuals outside kolkhoz)	60.4	57.3
Employees—sluzhashchiye (all nonmanuals outside kolkhoz, also designiated as intelligentsia in the wider sense)	27.5	26.1
Workers and employees together	87.9	83.4
Kolkhozniki (collective farm members)	17.5	16.6
Total in public labor force	105.4	100.0

Sources: Nar khoz, 1969, pp. 420, 530; Izvestiya, Jan. 26, 1969. Pravda, Jan. 25, 1970.

The philosopher and sociologist, Professor M. N. Rutkevich recently appointed director of the Institute of Concrete Sociological Research in Moscow, charges that serious errors are made by the statistical authorities when placing people in various categories: "During the 1959 census executed by the Central Statistical Administration, ten percent of those included in the category of 'predominantly nonmanuals' [intelligentsia] were [actually] qualified workers [manuals] * * * [e.g.] all people employed in trade organizations." The official categories were no more sufficient for statistical and demographic purposes in the U.S.S.R. in Stalin's time. The 1939 census, for example, gave data on "the population of the U.S.S.R. by social group," distinguishing between eight categories, as follows:

(1) workers (urban and rural)
(2) employees [*sluzhashchiye*] (nonmanuals, urban and rural)
(3) collective farmers
(4) craftsmen in cooperatives
(5) individual peasants
(6) independent artisans
(7) professionals
(8) non-working

A demographic test written in the last years of Stalin's rule stressed that "it is not difficult to see that the differences between groups (3) and (4), as well as between (5) and (6), are rather by branch of the economy than by class." (Boyarskiy and Shusherin.)

The census of 1959 used a still wider variety of "social groups" or "categories of the population;" one table of the census, showing "the division of the population by sources of income," lists eleven categories, as shown in Figure 3.

FIGURE 3.—*Social Groups by Source of Income—Census of 1959*

(1) *workers* [*rabochiye*].
(2) *employees* [*sluzhashchiye*]—of state, public, and cooperative organizations and enterprises.
(3) *persons hired* by citizens' collectives [e.g., by housing cooperatives].
(4) carpenters, stove-makers, and other *craftsmen self-employed* in construction and repairs ["craftsmen not in cooperatives"].
(5) *collective farmers* employed in the public economy.
(6) family members of collective farmers, workers, and employees *employed on the* [*private*] *household farm.*
(7) *armed forces.*
(8) *dependents*—children, old people, housewives.
(9) *pensioners.*
(10) *recipients of* grants [students].
(11) *employed* [*privately*] on small private farms [also domestic help, self-employed translators, secretaries, draftsmen, etc.].

Source: Adapted from TsSU, *Itogi*, 1962, pp. 96–97.

The program for the 1970 census basically provided for the same classification. The need for a more refined scheme of social classification than the official one appears in many contexts. In a volume published by the Komsomol Central Committee in 1969 and based on a conference on "Socialism and Youth," held in 1967, it is argued:

> The young people are not only an age-group and a demographic category, but also a *social* [emphasis in the original] group, which has substantive special features of its own. In accordance with the actual preservation of social and class differences in socialist society, it is necessary to distinguish certain social groups among the Soviet young people: working youth, kolkhoz youth, the young intelligentsia students [!!], etc. . . . However, it is not such differences that, first and foremost, characterize the youth of socialist society. Incomparably more essential are those general traits which characterize Soviet youth as a whole, which predetermine its unity and which allow one to speak about it as a *uniform social group.*

Yet, while advocating such a theory, the same publication heavily attacks "bourgeois sociologists," who substitute biological relations [between generations] for class relations." (Kogan, Molodezh, 1969.) It is further argued that "in order to master the mechanism of molding the individual, it is necessary to study carefully the various groups, subsystems, and structures, beginning with such wide ones as 'a class,' and ending with those in which the real life of the individual is directly going on (the family, a production or study collective, etc.)."

The Komsomol volume, therefore, sets out a broader scheme of criteria for group-differentiation in society (see Figure 4), than that utilized by the official census.

Though much broader and more flexible than the official scheme, these (Figure 4, for example) often still do not mention some social groups or categories of the population which are taboo to the regime—e.g., the clergy of all religions, the semi-legal and illegal private entrepreneurs of all kinds (from the *tolkach* to the large-scale illegal manufacturer and trader), the unemployed and criminals, the labor camp population, etc. This is so despite the fact that some of these "categories" of the population were very numerous—for example, dur-

ing Stalin's time—and still today are more numerous than some of the officially recognized categories.

FIGURE 4.—*A General Scheme of Social Group Differentiation (Komsomol, 1969)*

A generally accepted differentiation of [social] groups is according to the following *socio-demographic characteristics:*

(1) by *classes* (the working class and the collective farm peasantry).

(2) by *social status* (working and non-working population, including: intelligentsia working at enterprises, intelligentsia not at enterprises, employees who are non-specialists [white-collar], students, pensioners, housewives, etc.

(3) by the *character of labor* (physical and mental).

(4) by *occupation* * * * (within physical labor, for example: miners, metal workers, chemical workers * * * construction workers, etc.; and in mental work: state administrators, directors of enterprises, technical specialists at enterprises ('ITR'), medical specialists * * *—altogether, without further subdivision, more than forty [major socio-occupational] groups).

(5) by *income* (* * * in some official documents, for example, such categories appeared as highly paid persons and those with low pay; it is obvious, however, that in relation to this matter society is divided into a greater number of groups).

(6) by *education* (persons with higher * * * [to] less than primary education).

(7) by *residence* (rural and urban population).

(8) by the *type of urban settlement* (in towns up to 5,000 inhabitants * * * inhabitants of non-industrial towns, of major industrial centers, etc.).

(9) by *area* of residence: (a) administrative area; e.g., in union-republics, autonomous republics, etc.; (b) geographic regions; the Center, the Far North, Central Asia; and by economic-geographic regions; e.g., the Urals Western Siberia, the Baltic area, * * * etc.

(10) by *sex* (men, women).

(11) by *age.*

(12) by *family status.*

Source: Kogan, *Molodezh*, 1969, pp. 53–55.

Though official theory recognizes the existence of two classes and the intelligentsia in Soviet society, it stresses that they are not the old classes, but entirely new social groups such as have never been seen before.

According to V. S. Semenov, for example, the U.S.S.R. now possesses a "socialist intelligentsia," eighty to ninety percent of which had its origins in the working class or the peasantry. The interests of this new intelligentsia, moreover, are seen as being the same as those of the classes which gave it birth. Not only the intelligentsia, but also the working class is seen as being essentially different from such a class elsewhere. Thus, Suslov can assert that the Soviet working class does not contain the workers' aristocracy and bureaucracy of former times, that unemployed workers have ceased to exist, while the base [of the working class] has been broadened to include women and rural workers.

The peasantry has likewise been transformed into an essentially new class by virtue of the change from the private to the collective form, and is now an ally of the working class (although the latter still "leads" society). It is further asserted that the "private-ownership psychology" of the peasantry has been overcome in favor of "collectivism." As a result of these changes:

The Soviet people are a social community hitherto *unknown in history*, with a single social basis and unity of interest and aim. The workers and peasants are *special classes* which have a single social basis—socialism. (Chesnokov, *Historical Materialism.*)

FIGURE 5.—THE OFFICIAL MODEL OF SOCIAL STRUCTURE IN THE U.S.S.R., SOVIET POPULATION BY SOCIAL GROUP, INCLUDING FAMILIES, 1913–70

[In percent]

Socioeconomic group	1913	1924	1928	1937	1939	1955	1956	1959	1961	1962	1963	1964	1965	1967	1968	1969	1970
Total population	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Workers and employees	17.0	14.8	17.6	45.7	50.2	58.3	59.5	68.3	71.8	73.6	74.3	75.1	75.4	77.3	77.7	78.4	80.0
Workers	14.0	(1)	12.0	(1)	32.5	(1)	(1)	48.2	(1)	(1)	(1)	(1)	(1)	(1)	(1)	54.5	55.0
Employees [2]	3.0	(1)	3.6	(1)	17.7	(1)	(1)	20.1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	23.9	25.0
Collective farmers and cooperative artisans		1.3	2.9	48.8	47.2	4.1	40.0	31.4	28.0	26.3	25.6	24.8	24.6	22.6	27.2	21.6	20.0
Individual peasants and independent artisans	66.7	75.4	74.9	5.5	2.6	.5	.5	.3	.2	.1	.1	.1	.0	.03	.03	.30	.0
Bourgeoisie, landowners, merchants, and kulaks	16.3	8.5	4.6														

[1] Not available.
[2] Nonmanuals, intelligentsia in the broad sense.

Sources: For 1913, 1939, 1959, 1970, Nar. khoz. 1970, p. 22; for 1924, 1937, 1963, Nar. khoz. 1963, p. 28; for 1955, Nar. khoz. 1956, p. 19; for 1956, Dostizheniya Sovetskoi vlasti za 40 let, p. 11; for 1961, Nar. khoz. 1961, p. 27; for 1962, Nar. khoz. 1962; for 1964, Nar. khoz. 1964, p. 33; for 1965, Nar. khoz 1965, p. 42; for 1967, Nar. khoz. 1967, p. 35; for 1968, Nar. khoz. 1968, p. 35; for 1969, Nar. khoz. 1969, p. 30; and for 1970, Nar. khoz. 1970, p. 22.

On the other hand, however, Soviet official theorists argue that "socialism does not create new classes and social groups." It seems at first that there is a contradiction here. It may, however, be resolved by pointing out that for Soviet theorists the word "new" acquires two different meanings, depending upon the context. When arguing that "socialism does not create *new* classes," they refute arguments such as the idea that "a new (managerial ruling) class" has appeared in Soviet society, a class that did not exist at all before. When saying that the Soviet peasantry or working class is "a new class," they mean that the old peasantry or working class have been so changed and transformed that they have become "new." In the latter case, "new" relates to change in quality; in the first case, the meaning of new is "newly born," "that which had not previously existed."

The official model of Soviet social structure can be presented in a comprehensive table (see Figure 5).

Whatever the case, it appears that these are new features in Soviet social structure, different from those that existed hitherto.

Empirical research reveals the existence of six major observable and distinct social groups, as shown in Figure 6 below. The designation of these social groups follows closely the evidence from Soviet material; though, of course, Soviet theorists do not regard "people in authority and managers" as a separate social stratum and do not call them collectively *nachalniks*. Four of these major social groups discern features associated with social classes (the workers, collective farmers, intelligentsia and the nachalniks). The white collar employees and privately employed lack the necessary cohesion and consciousness of belonging, to be regarded a class in their own right. They can be considered as strata. Following these designations it is possible to speak about "the nachalnik class" in the U.S.S.R. which monopolizes the functions of management and decisionmaking.

FIGURE 6.—*The Six Major Social Groups of Soviet Society*

(1) *workers* (*rabochiye*)—manuals, producing goods and services outside the *kolkhoz*.
(2) *collective farmers* (*kolkhozniki*)—members of collective farms, engaged mostly in agricultural work and services supporting it.
(3) *white-collar employees* (*sluzhashchiye*)—non-manuals, in work which does not require specialist education.
(4) *intelligentsia*—those occupied in mental work which requires specialist (higher or secondary) training.
(5) *nachalniks*—those in positions of authority and management whose main work is the control of men.
(6) *privately employed*—hired and self-employed people not receiving a salary or wage in the public economy.

Apart from these six major groups, there are also intermediate social strata: the *sovkhoz workers*, who display characteristics of both workers and peasants (especially those who had been in *kolkhozy* which were transformed into sovkhozy); the *kolhoz intelligentsia*, an intermediary position between the two groups; the petty *nachalniks*, who share certain features of the white-collar (or skilled) workers and of the *nachalniks*. To some degree, it is possible to regard the engineering-technical personnel (ITR) at the enterprises and the worker-aristocracy ("worker-intellectuals") as intermediary groups between the intelligentsia and workers.

As can be seen, in the designation of these major social groups, no distinction is made between those linked with state-ownership and those employed by public organizations or by the (formally) cooperative sector.

Such a distinction would be logical for a traditional Marxist who regards relationship to property as *the* basic determinant of social status. Within the proposed scheme this relationship is one among other equally important determinants. Of the six major groups, only the *kolkhozniki* and the privately employed have a 1-to-1 relationship with a specific form of ownership. Yet, they are regarded as separate major social groups not only because of this, but because of other related factors such as the attitude of the authorities toward this group, the actual differences in personal status which stem from these factors.

Estimates of the size of the six major social groups and of some of their subdivisions may be provided on the basis of the 1959 Census and latest available data (see Figure 7).

FIGURE 7.—MAJOR SOCIAL GROUPS IN SOVIET SOCIETY

[Statistical estimates]

	1959		1970
	In minutes	Percent	(percent)
(1) Nachalniks	2.25	2.0	2.8
(2) Intelligentsia	10.00	9.0	12.6
(3) White-collar employees (service and technical employees)	7.28	6.5	9.6
(4) Workers	48.20	44.5	55.0
Including:			
(a) Highly skilled	5.00	4.5	5.5
(b) Skilled	20.00	18.5	22.8
(c) Unskilled	23.20	21.5	26.7
(5) Kolkhoz peasants	31.40	28.0	20.0
Including:			
(a) Administrative staff and intelligentsia	2.25	2.0	1.43
(b) Equipment operators and skilled	3.50	3.0	2.15
(c) Unskilled	25.65	23.0	16.42
Subtotal, officially employed	99.13	90.0	100.00
(6) Employed privately	11.16	10.0	----
Including:			
(a) Individual peasants	.30	----	----
(b) "Members of families of kolkhozniki and of workers and clerks employed in auxiliary private economy"	9.86	----	----
(c) Others (estimate)	1.00	----	----
Total labor force—official and unofficial	110.29	100.0	----

Note: Percentages are rounded. Data for 1970 are based on Nar. khoz. 1970, p. 22 and broken down into subdivisions on the assumption that the percentages remained the same as in 1959 (there are no percentage data for 1970). Actually, some changes occurred, e.g., the percentage of skilled in all categories has risen.

Sources: A. Amvrosov, Izvestia, Aug. 11, 1967, p. 3; A. Zvorykin, Vop. ekon., October 1961, p. 26; Nar. khoz., 1960, p. 37; V. S. Semenov, vop. fil., No. 9, 1965, p. 144; Spravochnik partiinogo rabotnika, 1960, pp. 808–809.

B. The Dissenter's Views on Soviet Society

Many of the basic sociological themes have reappeared in contemporary dissent literature. In the same way that the earlier writers had a distinct vision of what they thought was happening to Soviet society, present-day dissenters also provide a more or less distinct set of images.

While somewhat diverse in its social and intellectual origins, in points of departure, and in ideological orientation, this literature of dissent appears to accept a number of common assumptions which can be outlined as follows.

1. THE RULING GROUP

There is a *ruling class or stratum*, the core of which is the Party apparat or the *nomenklatura.*

This ruling group enjoys immense *privileges* at the expense of the people as a whole, in complete contradiction of everything that Communist ideology and that of the Bolshevik Revolution professed.

Some regard this situation as unique to the U.S.S.R. and believe that it can be solved by simply introducing full democratic rights (the *Program of the Democrats*). Others regard the existence of a privileged stratum as normal and comparable to other highly industrial societies where, despite democratic rights, a privileged minority rules (Sakharov). Still others regard the existence of a strong centralized state power, and a privileged group exercising it, as a positive and necessary part of a long-standing Russian tradition ("the nationalists"). But all agree that it exists.

The far-reaching political controls and suppression by the ruling group are interpreted as a means for defending its power and privileges. Thus, a basic clash of interests exists between this group and the rest of the population.

2. BASIC SOCIAL STRUCTURE

The basic ideas of the dissenters on Soviet social structure suffer from a lack of sociological sophistication, which, understandably, has been customary in Soviet society. Many of the basic concepts of Soviet Marxism are accepted. Apart from the "ruling group," usually three large social units (classes) are delineated: the intelligentsia, workers, and peasants.

In conjunction with their acceptance of the concept of the Soviet ruling class, the dissenters argue that it has created for itself additional bases among the other social groups through privileges accorded to parts of the intelligentsia and working class.

3. THE INTELLIGENTSIA

Most—but not all—of the dissenters look toward the intelligentsia as the only possible social force which can bring about a positive transformation of Soviet society. The nationalists scorn its "naive-liberal" members. Amalrik regards it as a Soviet "middle class." However, his criticism of it reveals his departure from any concept of middle class accepted in the West. And only Amalrik, as the most "Westernized" writer among the dissenters, when writing mostly for Westerners, uses this concept.

The intelligentsia, however, is of a dual character, since many of its members are accorded special privileges by the ruling group and because many have acquired the mentality of state employees (civil servants).

4. THE WORKERS AND PEASANTS

The workers are denied any real part in decision-making, either in the country or in the factory. A labor aristocracy has developed which enjoys privileges and supports the existing system.

Many of the workers are uprooted peasants, alien to their new urban environment, unable to develop their true personalities.

The peasantry is the most exploited and discriminated against social group. It has served as an "internal colony" of sorts. Interestingly, none of the aforementioned authors mentions a *peasant* aristocracy under the Soviet system.

5. THE FORCED LABOR POPULATION

Today the forced labor population is not of a considerable dimension. It embraces only some tens, perhaps hundreds, of thousands. In Stalin's time its numbers were counted in many millions. The basic structure of this population seems to remain the same and is of great interest to the sociologist.

According to labor camp literature, this unique population has a strátification system of its own, in which—to a greater extent than is the case "outside"—political determinants such as the attitudes of the central authorities, and the ways of the local camp administration, are of decisive importance. Far from being a homogenous social group of atomized individuals, the prison population has a hierarchical structure of its own, some unusual group structures such as differentiation by the type of camp, the gang, and a wide social diversification along the lines of relative "wealth," type of "sentence," camp-position, ethnic origin, occupation, and so forth.

Such are the general assumptions which underlie much of the *samizdat* materials. For the most part, however, there has been little attempt to make a sustained and systematic analysis of Soviet society, many of the writers making only fragmentary asides. The major exception to this rule has been the work of the so-called "constitutional democrats," particularly in their two programmatic documents, the *Program* of 1969 and the *Memorandum* of 1970. Of the two, the latter provides the most explicit social analysis to be found in *samizdat.*

C. Toward Classless or Elitist Society

One of the several possible schemes we could use to represent the stratification of Soviet society is the hierarchical which utilizes such criteria as income, status, education, and life style. Such a model classifies people occupying similar positions on a vertical scale into common groups (e.g., the middle class, the elite) regardless of such dimensions as relationship to authority (power) or ownership of property. For example, in the upper-middle class it would include: doctors, lower Party officers, highly skilled workers, managers of medium-size collective farms, some groups of professionals, rich private operators, managers of medium-size industries, and so on—provided they occupy a similar position in regard to the selected criteria. Sometimes Soviet sociologists use this kind of model to study the population of a given locality. M. V. Timyashevskaya evolved such a classification of social groups for Akademgorodok, the science town near Novosibirsk (see

Figure 8). When this method is applied to Soviet society as a whole, the result may look like the hierarchical-stratification model presented in Figure 9.

FIGURE 8.—SCHEMATIC CLASSIFICATION OF SOCIAL GROUPS IN AKADEMGORODOK SPHERES OF ACTIVITY AND THEIR RELATIONSHIPS (IN PERCENT)

Social groups and their relationships (in percent)	Science, 51.5 percent	Construction, 28.4 percent	Services, 12.3 percent	Health services, education, state apparat 7.8 percent
Group I: 10.5 percent (top managers and specialists).	Directors on institutes, scientific institutions and subdivisions; senior scientific associates.	Directors of trusts, enterprises; leading designers, chief specialists.	Chief of workers' supply department.	Directors of institutions, school directors, hospital directors, chief physicians, leading Party personnel.
Group II: 47.1 percent (middle-level managers and specialists).	Junior scientific associates; senior teachers; engineers of research institutes.	Chiefs of shops and sections; engineering-technical personnel.	Heads of stores, ateliers, hotels; chief specialists of service enterprises.	Physicians, teachers, jurists, heads of institutions, bookkeeper, etc.
Group III: 22.4 percent (lower specialists, white-collar employees, and workers).	Technicians; senior laboratory workers; and laboratory workers.	Middle-level technical personnel, foremen, wage-earners.	Salaried employees; senior sales-persons; sales persons; receptionists; communications personnel.	Senior nurses; nurses; (vospitateli).
Group IV: 20.0 percent (low-skill white-collar employees and workers).	Junior service personnel; low-skill wage-earners.	Junior service personnel; low-skill wage-earners.	Junior service personnel; low-skill wage-earners.	Junior service personnel; low-skill wage-earners.

Source: M. V. Timyashevskaya, "O nekotorykh sotsial'nykh posledstviyakh gradostroitel'nogo eksperimenta," in Yanitsky, Urbanizatsiya, 1970, p. 286.

FIGURE 9.—*Hierarchical-Stratification Model (an example)*

I. The Elite (upper class)

1. Top "*nachalnik*" group.
2. Cultural and scientific elite.

II. Secondary Elite (lower upper-class)

1. Secondary central and top provincial *nachalniks.*
2. Middle-level intelligentsia.
3. Top private operators.

III. Upper-middle Class

1. Middle *nachalnik* stratum.
2. Middle-level intelligentsia.
3. Top management and specialists in collective farms.
4. Middle stratum in private sector.
5. Workers "aristocracy".

IV. Middle Class

1. Petty *nachalnik* group.
2. Lower intelligentsia.
3. Highly qualified workers.
4. Secondary collective farm management and rich *kolkhozniki.*
5. Top white-collar employees.
6. Private artisans, small merchants.

V. The Working Classes

1. Ordinary workers.
2. Ordinary white-collar employees.
3. Middle-level collective farmers.
4. Lower groups in private sector (working on the subsidiary plots, low-earning craftsmen, privately hired workers).

VI. The Poor Classes

1. Minimum-wage laborers.
2. Poorly paid white-collar employees.
3. Poor collective farmers (in poor *kolkhozy;* without cow, orchard, plot).
4. Others: families without breadwinners, low-income pensioners.

NOTE.—Groups have been placed in terms of high to low by income, education, prestige, and life style. This table is from a paper prepared by Z. Katz for a class at Harvard University (1970, unpublished). See K. I. Wädekin in *Ost Europa,* 1965, no. 5, who divides Soviet society into four main categories: upper, upper-middle, lower-middle, and lower.

FIGURE 10.—*Political Stratification in Soviet Society (based on the Party-member/non-member division)*

1. Party members:
   - (a) central leadership
   - (b) republic and regional leadership
   - (c) middle leadership (provincial and district level)
   - (d) lower leadership (primary Party organizations)
   - (e) Party activists
   - (f) ordinary members
   - (g) candidates for membership
2. Members of the Communist Youth League (Komsomol):
   - (a) in leadership positions
   - (b) Komsomol activists
   - (c) ordinary members
3. Non-Party members:
   - (a) in responsible positions
   - (b) in influential positions (scientists, writers, professionls)
   - (c) members of elective bodies
   - (d) non-Party activists
   - (e) ordinary citizens
4. Special category: politically repressed (prisoners, non-prison un-persons, etc.)

Source: Cf. Avtorkhanov. *The Communist Party Apparatus* (Chicago: Henry Regnery Co., 1966); . Achimow, *Die Macht in Hintergrund* (Grenchen/Ulm: Spaten Verlag, 1950). This table was prepared by Z. Katz for a class at Harvard University (1970, unpublished). Also, parts of the Harvard Project on Soviet Society analyzed the Soviet population in terms of the Party/non-Party cleavage. See Bauer et al., *The Soviet System,* 1956 and Inkeles and Bauer, *The Soviet Citizen,* 1959.

Another possible scheme to be considered is the political stratification model which is primarily based on relationships to political power. In regard to the Soviet Union such models often revolve around the Communist Party. The basic division of the population may then be arranged as shown in Figure 10. This model supposedly portrays the basic dispersal of political power in Soviet society. Only some overall data on total membership and the membership of some Party bodies are available. Some rough approximations may be possible, but the margin of error would be considerable. Stephen Rapawy estimates Soviet civilian full-time Party employment (including those in economic organizations) as follows:

1960	383,000
1964	409,000
1969	492,000

whereas Fainsod gave two divergent estimates for 1961—100,000 and 150,000–200,000. These divergencies may have been the result of different definitions and methodology (e.g., referring to responsible officials in one case and to a wider category of Party employees in the other.)

Though Party membership is, as a rule, mandatory for any position of responsible management, there are exceptions. A number of non-Party members do, in fact, occupy various responsible positions.

FIGURE 11.—COMPOSITION OF PARTY MEMBERS/SALARIED EMPLOYEES BY KIND OF WORK, 1956–71

[As of January 1, in percent]

Kind of work	1956	1961	1971
Total number of communists, salaried employees	100.0	100.0	100.0
Directors of organizations, institutions, enterprises, construction sites, State farms and their structural subdivisions (nachalniks)	14.0	10.4	8.2
Engineering, technical personnel, agricultural specialists (technical intelligentsia)	18.2	26.4	37.7
Scientific personnel, teachers, physicians, writers, and artists (creative intelligentsia)	18.9	21.3	23.5
Others (not identified, residual)	46.9	41.9	30.6

Source: Petrovichev, "Partiinoye," 1971, p. 65.

FIGURE 12.—COMPOSITE PROFILE OF NACHALNIKS IN THE 5 SAMPLES

	Item and indicator	Leningrad	Kazan	Pskov	Menzelinsk	Al'met'yevsk	Unweighted arithmetic mean
1	Party membership (percent)	54.5	61.3	65.5	54.5	55.5	58.0
2	Voluntary social activities (percent)	84.2	93.5	(1)	100.0	(1)	92.5
3	Reading newspapers regularly (percent)	85.4	93.5	(2)	(2)	(2)	89.5
4	Reading no fiction (percent)	7.3	(2)	3.4	(1)	(1)	5.3
5	Average housing space per capita (square meter)	7.0	7.8	6.7	(1)	(1)	7.1
6	Average size of family (persons)	3.2	3.6	(1)	(1)	(1)	3.4
7	Average monthly pay (rubles)	172.9	164.3	(1)	141.8	178.3	164.3
8	Average monthly income per capita (rubles)	[3] 71.1	[4] 74.1	(1)	(1)	(1)	72.6
9	Have friends among workers and peasants (percent)	22.4	21.5	10.0	(1)	(1)	17.8
10	Not of workers' or peasants' origin (percent)	36.7	37.6	(1)	(1)	(1)	37.1
11	Spouse, professional or white-collar (percent)	65.0	63.0	(1)	(1)	(1)	64.0
12	Children, professional, white-collar, or students (percent)	87.0	(1)	(1)	(1)	(1)	87.0
13	Average age (years)	41.8	39.1	37.9	37.0	35.9	38.3
14	Work seniority (years)	20.1	18–19	18–19	18–19	18–19	19.0
15	Average education (years)	13.6	12.9	(1)	12.2	12.9	12.9

[1] No data.
[2] Similar to other data in same category (column).
[3] 1965.
[4] 1967.

Source: Massachusetts Institute of Technology. Center for International Studies, "Urban and Rural Nachalniks—A Profile." Project on Sociology of Soviet Audiences. September 1972, p. 2.

Among the features by which class may be defined are: (1) relationship to the social system (function), (2) relationship to resources (ownership), (3) to income, (4) to power, and (5) to education.

1. RELATIONSHIP TO THE SOCIAL SYSTEM (FUNCTION)

The term *function* is used in a common-sense fashion, though its meaning is not far from that of the structural functional school. Function relates to the actual main life activity of the members of a class and to the role the class as a whole plays within the given social system. There is, however, no single set of functions which invariably is the basis for the emergence of a social class in *any* society. Rather, the situation varies in different societies and at different points of their development. For example, in all societies there is some group of people whose main life activity is to attend to the religious-ideological needs of the members of that society. In certain societies this

group becomes a large, wealthy, distinct, and structured group with an esprit d'corps of its own. It is a major force in the non-ideological areas of life in the community and has distinct institutional and self-perpetuating mechanisms of its own. In short, it is a social class. In other societies, it is only a minor subgroup within a larger social class. The same may be said about such groups as craftsmen, merchants, farmers, political bureaucrats, slaves, and so on.

Under Soviet conditions, the production of material goods (part of the adaptive function in Parsons' terms) is not the basis for one social class but rather a field in which a few classes and intermediary strata are involved. On the other hand, the ideological or defense functions, which in many a society have been the basis for the emergence of fully fledged large social classes, have created only subgroups: one stratum (the military) and one rather weak group (the ideological apparat of the Party) within the top social class.

2. RELATIONSHIP TO RESOURCES (OWNERSHIP)

It is not the formal title of ownership but the actual relationship to all resources (i.e., things that meet the needs of the population of which property is only one instance), the actual *control* of resources, that can be of crucial importance in determining social relations. Formal ownership remains of decisive importance where it is connected with an actual degree of control, and also where it bestows other things beyond this control such as social prestige, income, power, and influence. Where it is not correlated with these, it is *actual control* that is decisive. This is especially so under Soviet conditions.

Until recently, this problem was taboo in Soviet literature. It is now being raised by some of the bolder social scientists in the U.S.S.R. Arutyunyan argues that there is a need for "a sober appraisal of the social significance of property and of its role in the system of stratification-determining factors." He sees three functions as relating to property—"ownership," "control" [*rasporyazheniye*], and "utilization." And, although all citizens in a socialist country are equally owners of nationalized property, he claims "they enter into differentiated relationships in regard to utilization and control of property. In socialist society, the three functions do not usually coincide. Collectives and individuals who do not own the particular public property individually actually control and utilize it. They act as 'functionaries' or 'agents' of the public property." In this connection, "the central problem is the division of powers and rights inside the collective, i.e., between its members. In other words, it is necessary to clarify how the utilization of certain property is actually conducted within the system."

Quoting Lenin's famous dictum that "each cook will rule," Arutyunyan warns that this should not be taken literally. Such a rule by all "will be possible only when the population is highly educated and has had a rich social experience." As long as this is not the case, "the function of control is executed by administrators who are especially designated and professionally trained for this purpose." The complex relationships to property in a socialist society are also discussed by a number of other Soviet authors.

3. RELATIONSHIP TO INCOME

The factor which, for brevity, we usually call "income" encompasses (in Soviet society as in any other) both formal and informal income, as well as all kinds of material benefits, rewards, services, and privileges. The non-formal material benefits which come with certain positions in Soviety society have had an especially decisive impact upon the actual standard of living (and social status) during times of crisis and shortages as a result of centralized allocation of scarce resources. This fact makes it more difficult to gauge income since data on informal prerequisites are difficult to find.

Though in some ways closely related to each other, these first three characteristics—functions in society, relationship to property, and income—are of course conceptualized as separate dimensions. There are often large-scale incongruences between them, and it is impossible to take one of them as an index for the others. For example, people who have no direct relationship to property may have a very high income; or those who fulfill a highly decisive function in society may have a relatively low income and no property and so forth.

A U.N. source provides figures for the differences in wages between workers, specialists, and administrative and clerical personnel in the U.S.S.R. (see Figure 13).

According to these data the initial large gap between the earnings of these groups has been considerably narrowed. In 1932 the workers earned 2.6 times less than the specialists, and in 1964 only 1.5 times less. Whereas in 1932 the administrative and clerical personnel earned 150 percent of the average earnings of workers, in 1964 their income decreased to 84 percent.

FIGURE 13.—THE DIFFERENCE BETWEEN MONTHLY EARNINGS OF WORKERS, ITR [1] AND ADMINISTRATIVE-CLERICAL PERSONNEL, 1932–64

[Workers' earnings=100]

Year	Manual workers	Engineering and technical personnel	Administrative and clerical personnel
1932	100	262	150
1935	100	236	126
1940	100	210	109
1950	100	175	93
1955	100	165	88
1959	100	151	80
1964	100	144	84

[1] ITR=engineers and technicians. See Katz, "Debate," 1971, pp. 72–73.

NOTE.—Such U.N. tables are basically compiled according to data supplied by the respective governments. An additional analysis is necessary to bring out the meaning of these figures. For example, the category of "administrative and clerical personnel" includes great numbers of ordinary clerks who are very poorly paid as well as the top Soviet managers, whose total salaries are many times higher than the workers. In a private communication to this writer, a foremost Western specialist expressed his conviction that these figures apply to industrial-production personnel only (people employed in the basic activities of industrial enterprises).

Source: U.N. Department of Economic and Social Affairs, 1967 Report on the World Situation (New York: U.N., 1969) p. 191.

Soviet and Western specialists alike agree that since 1953 a series of measures, undertaken by the government for the equalization of income, have narrowed the immense disparities created during the Stalinist period. Writing in 1963, M. Yanowitch called this process

"an income revolution." Janet Chapman thought it "quite plausible" that the decile ratio for the earnings of industrial workers decreased from 3.38 in 1956 to less than 2.8 in 1961 as a result of a major wage reform. After reviewing the opinion of these writers, Kirsch largely agreed with them in his "Soviet Wages," (1972). He added that the latest measures announced at the XXIV Party Congress in 1971 (e.g., raising the minimum wage to 70 rubles per month in 1972–74) "indicate that Yanowitch's phrase has a new appropriateness for industrial workers and even more so for total employed personnel."

However, this process is only one aspect of the complex picture of income differentiation in the U.S.S.R. Much of the data scattered throughout the Soviet economic and sociological literature provide evidence that despite the partial equalization process, income differentiation remains very pronounced indeed.

Citing results from a detailed study of family budgets in "one (unspecified) region of the country," Korzhenevskiy provides the data in Figure 14.

FIGURE 14.—*Members of Families of Workers and Employees by Annual Income*

Annual income in rubles per person:	*Percentage of total*
Less than 600	32.6
601–900	31.2
901–1,200	17.7
1,201–1,500	9.1
1,501–1,200	7.1
More than 2,100	2.3

Source: Korzhenevskiy, *Osnovnyye*, 1971, p. 112.

From the information in Figure 13, it appears that about one-third of the non-*kolkhoz* population in this region had less than 50 rubles per month (600 per year) which is regarded by Soviet specialists as the basic living minimum. In Western terms, these people are below the poverty level. Almost another third (31.2 percent) earned only slightly above that level (between 50 and 75 rubles per month). One tenth (9.4 percent) earned more than 125 rubles per month per person. The span between the lowest and the highest incomes (600 and 2100) is 1:3.5. Since the income of the *kolkhoz* population is ordinarily lower than that of the "workers and employees," the poverty group within it must be even greater.

A Leningrad survey (1962–1963) of 10,000 workers showed that over 40 percent of their families had less than 50 rubles per capita per month. A survey of coal miners in the Kemerovo area in 1967 found only 5 percent of their families below the 50 ruble mark; but miners are a highly paid group in the U.S.S.R. A Soviet economist S. P. Figurnov, writing in 1962, indicated that over 30 percent of the workers and employees were poor by Soviet standards. P. Wiles cited the same percentage for 1966. A. Sakharov also wrote that "40 percent of the Soviet population is in difficult economic circumstances."

Soviet specialists (e.g., Sarkisyan and Kuznetsova) have designated the sum of fifty rubles as the "minimal budget" necessary for the basic needs per person of a non-*kolkhoz* family in the mid-sixties. The new Soviet five-year plan envisages special welfare payments and other benefits to children in families whose income is below this level, thus giving "official recognition" to the poverty estimates. This is planned, however, only for the mid-seventies. Though most prices in the

U.S.S.R. are stable, a degree of inflation has to be taken into account. Moreover, by then the minimum will have also moved higher for social reasons (rise in needs, aspirations, general standards). It appears that government measures dealing with poverty in the U.S.S.R. are by no means rapid or prodigious.

Soviet sources also spell out the differences in income between various socio-occupational groups, including the managers as a separate category (see Figure 15).

FIGURE 15.—SURVEY OF INCOME DIFFERENTIATION BY CATEGORY OF EMPLOYMENT, 1967–68

[In rubles, in rank order]

Category of employment	A. Average monthly wages	B. Average monthly per capita income
1. Salaried employees engaged in managerial posts	169	81
2. Highly skilled wage earners	144	72
3. Engineering-technical personnel and other specialists in the material productions sphere	117	78
4. Skilled wage earners	111	69
5. Teachers, scientists, medical and other specialists outside the material production sphere	110	81
6. Salaried employees without specialized education	84	66
7. Unskilled and low-skilled wage earners	74	62

Note.—As can be seen, this is not a comprehensive table, e.g., it does not include kolkhozniki. Managers are on top, both by average monthly income (A) and by income per capita (B). Highly skilled wage earners are second by A, but only in 4th place by B. Specialists in the nonproduction sphere rank second for B (actually, the same as salaried employees in managerial posts), though they are 5th by A. White-collar workers and unskilled wage earners occupy on both counts 6th and 7th places respectively. The income of the managerial employees is about 2.3 times higher than that of the unskilled and low-skilled wage earners. The difference per capital between these 2 categories goes down to 1.3.

Source: Gordon and Klopov, "Nekotoryye," 1970, p. 192.

Data on income differentiation by social group is found in Arutyunyan's latest book which is based on sociological surveys of several regions of the U.S.S.R. (see Figure 16).

FIGURE 16.—AVERAGE MONTHLY WAGE IN KOLKHOZY, SOVKHOZY AND INDUSTRY

[In rubles]

Year	A. Kolkhozy	B. Sovkhozy	C. Industry
1940	12	22	34
1950	17	38	70
1955	25	47	78
1960	28	54	91
1963	38	67	98
1967	63	82	112
1968	66	92	122
1970	[1] 75	([2])	133
1975	[1] 98	([2])	[3] 172

[1] Projection in the 1971–75 5 year plan.
[2] No data.
[3] Estimate based on the 5 year plan data.

Source: Arutyunyan, Sotsial'nava, 1971, p. 114, and Gosplan SSSR, Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaistva SSSR na 1971–75 gody, (Moscow: Izd. polit. lit., 1971) p. 282; Nar. khoz., 1970, p. 519; Pravda, Feb. 14, 1971, p. 5.

The ratio between columns A and C in Figure 16 reached its culmination in 1950, at the level of 1:4, stood at 1:3 in 1963, and decreased to 1:2 in 1968. It will decrease somewhat beneath this ratio by 1975 if the Five Year Plan projections hold. But, it will remain very significant. Yet, as Arutyunyan indicates, this is not the overall picture. It changes differentially with occupational standing. The greatest

difference between agricultural and industrial workers lies at the level of unskilled labor. The variations in the income of highly qualified specialists are only marginal. Yet, even in regard to pensions and other social benefits, the overall difference is considerable. In 1968 it amounted to 525 rubles yearly per industrial worker, but the average per citizen was 232 rubles. *Kolkhoz* members must have received even less than that, and very much less than industrial workers.

There is considerable income differentiation according to region (republic) though this has also diminished in the post-Stalin period. In 1953 the pay for a workday in a Lithuanian *Kolkhoz* was only about one-third of that in a Georgian or Turkmenian *kolkhoz*. By 1968 the ratio between the lowest average wage for a workday (in Byelorussia) and the highest (in Estonia) decreased to 1:1.8.

Besides *average* wage, considerable differences have remained. In 1967, the variance between the monthly income of a low-skilled *kolkhoznik* in the Tatar republic (30.6 rubles) and a highly qualified *kolkhoz* specialist or manager in the wealthier Krasnodar territory was 1:4.4.

A recent article by Hedrick Smith in the *New York Times* reported that directors and top academicians living and working in Akademgorodok (Science Town) near Novosibirsk earn more than 1,000 rubles monthly, which would amount to more than 12,000 yearly. At present, the official Soviet minimum wage is 60 rubles a month. The ratio between the minimum and these academicians' salaries is 1:16.5.

As for non-monetary income, benefits, and privileges, some information may be gained by examining the dispersion of certain high-cost durable goods (see Figure 17). Arutyunyan also supplies data on this subject. In his samples the percentage of top specialists and managers who have a television set is about double that of low-skilled workers. The percentage of *kolkhozniki* having television is considerably lower than that of *sovkhozniki*, or state-employed farm workers.

Although a series of measures has worked toward income equalization in the post-Stalin period, mention should be made of several factors which have had an opposite impact. The post-Stalin period was the first without major catastrophic upheavals in Soviet history. The social structure has not been disrupted. Under these conditions, perhaps for the first time since the Revolution, there has been the possibility of an interrupted accumulation of material assets by the elite groups and of intergenerational transfer of such amassed wealth. Such wealth may seem puny by Western standards, but under Soviet conditions, it can be regarded as immense riches.

The Brezhnev-Kosygin administration, in contradistinction to Khrushchev's, provides various high-cost material incentives to those who can afford them (or gain access to them): private cars, imported goods, tourist trips abroad, luxurious entertainment facilities at home, condominium (cooperative) flats, high-cost modern services (restaurants, hotels). Available now only to a small minority, such items become a mark of status, a Soviet equivalent of conspicuous consumption. The present administration stopped the Khrushchev campaigns against *dachas*, private subsidiary agriculture, and "economic crimes." Some measures such as the economic reform, incentives for technological progress, the campaign for improved business management, the creation of trusts and firms, as well as the "Shchekino experi-

ment," the new policies in regard to agriculture, apparently reinforce income differentials, benefiting first and foremost those who already have high incomes and better work conditions.

FIGURE 17.—LEVEL OF SUPPLY OF CULTURAL AND PERSONAL GOODS TO THE POPULATION OF AKADEMGORODOK, BY BASIC SOCIAL GROUP

[In percent]

Commodity	Group I	Group II	Group III	Group IV
1. Radio receiver	100	96	91	87
2. Sewing machine	75	80	90	80
3. Washing machine	90	75	88	75
4. Refrigerator	85	78	65	52
5. Television set	68	60	65	80
6. Library (over 100 books)	90	80	38	25
7. Bicycle, motorcycle, or motor scooter	50	42	70	40
8. Vacuum cleaner	68	34	30	10
9. Piano, accordian	45	30	20	8
10. Car or motor boat	22	10	8	8

Note: For a description of each group, see Figure 8 on page 32. As can be seen, the difference between the highest (group I) and the lowest (group IV) amounts to 7:1 for vacuum cleaners, 5.5:1 in regard to piano/accordion, 2.7:1 for car or motorboat, 3.6:1, library, and 1.7:1, refrigerators. Surprisingly, the differences for other items such as washing machines and radio receivers are not great; and regarding television sets and sewing machines, group IV even holds an advantage (nothing can be learned from the category formulated "bicycle, motorcycle * * *"). However, this is Akademogrodok, a "science town," famous all over the USSR. The situation here need not be representative of other parts of the country.

Source: Timyashevskaya, "O nekotorykh," 1970, p. 287.

To arrive at a full evaluation of the direction of income differentiation in the U.S.S.R. some additional matters must be examined; for instance, the relationship between the minimum wage and average wage. Though the minimum wage has been raised from 12 rubles in the middle 1930's to 60 rubles for the present, it only rose from 40 percent of the average wage to 48 percent at present. There must have been some rise at the higher income levels or a horizontal extension of the highly paid categories to account for it. Whichever the case, this factor counterbalances the equalization trend to some degree.

Apart from the amount of income, the source or *form of income* may also be important, especially as some kind of manifestation of the class situation of an individual or group. This was stressed by Marx who regarded the differences between land-rent, profit, and wages as the hallmark of differences between the three major Western European classes of his time. He stressed that classes differ not only by the dimensions of but also by the mode of acquiring a share of social wealth. In the U.S.S.R., for many years, *kolkhozniki* received most of their remuneration for work in kind, from the share of the production left for this purpose after all other obligations had been met. However, in the same *kolkhoz* the chairman and a number of top managers and specialists received a steady cash salary, which was primarily related to fulfilling and overfulfilling the state delivery quotas. Outside agriculture, workers usually receive wages, and non-manuals receive a salary. However, special categories of Party officials, managers, and security officers received, over a period of many years, additional special payments from the Central Committee ("the blue envelopes"), as well as special allocations of scarce goods and access to services in closed institutions. Perhaps, such a form of special income could be taken as an outward manifestation of belonging to the top layer of

the ruling elite. According to Roy Medvedev the well-known dissenter, "there are in the U.S.S.R. about 13,000 millionaires, i.e., top bosses whose bank accounts amount to seven digit sums." Another index is the "personal pension." Instead of the ordinary pension given to all Soviet citizens, which is limited by law to not more than 120 rubles per month, members of the elite and their families are often granted a "personal pension." It may also be given to a widow and to children until completion of their studies. This kind of pension is not limited to 120 rubles.

4. RELATIONSHIP TO POWER

The relationship with the polity is no doubt a crucial determinant of class stratification and a powerful influence upon the place of a group within the social hierarchy. The usual interpretation of this factor is in terms of participation or decision-making in the activities of the political system, or in terms of the control that a social group has over political power.

In regard to a socialist country (and, perhaps, to any modern society) this approach fails to include a number of important aspects. One of these relates to what may be called "industrial democracy" (participation in decision-making at the place of employment); the other concerns the stratification-determining powers of the modern state. We have dealt above with participation in terms of the control of property as one aspect of the relationship to resources. But, in a Soviet-type system where the state concentrates the management of almost all economic life in its hands, participation in decision-making at an individual's place of employment is as important an aspect of relationship to power as any.

It is a measure of the progress made by social science in the Soviet Union that data are now available on responses to such questions as "Do you feel you are an owner of the enterprise you work in?" and "To what degree do you feel you have an influence on matters within your work-collective?"

Similar results were obtained for other regions. Further studies have shown that the percentage of those who do not feel they have any influence is highest among the uneducated, whereas all the managers felt that they did have such an influence. The implications of the table are highly significant, especially in the Soviet context. Official formula asserts that every citizen in the U.S.S.R. is an equal owner of all national property and that every working person actually participates in its management. Therefore, there can be no alienation among Soviet citizens. Hitherto, there were no data reflecting the actual situation. Figure 18 gives an instance where the majority of the working people felt that they had no influence on decision-making in their collectives; among the low-skilled workers more than two-thirds felt this to be true. Data on dissatisfaction with work, also totally unavailable until recently, show a similar pattern. The highest level of dissatisfaction is found among the low-skilled and the lowest among the high-level managers and specialists. There certainly is a basis for widespread alienation in Soviet society.

FIGURE 18.—PERCENTAGE OF PERSONS EMPLOYED IN RURAL KRASNODAR TERRITORY WHO FEEL THEY HAVE NO INFLUENCE ON DECISIONMAKING WITHIN THEIR WORK-COLLECTIVES

Social group	Kolkhoz	Sovkhoz	Other enterprises	Total
High-level managers and specialists	10	9	(1)	9
Middle-level managers and specialists	28	18	24	21
White-collar workers	48	33	50	44
Equipment operators	45	61	32	50
Skilled manual workers	48	66	67	55
Low-skilled and unskilled manuals	59	74	67	65
Total	53	66	43	57

[1] No data.

Source: Arutyunyan, Sotsial'naya, 1971, p. 108.

As mentioned above, the traditional approach to relationship with the polity misses another decisive aspect of crucial importance in any society, one which is especially so in modern communist-ruled societies. Social stratification has been regarded as a spontaneous process due to the inherent mechanism of uncontrolled forces such as the economic market, perennial needs of society, differential distribution of political power, organizational imperatives, scarcity of talent, need for incentives through differential rewards, and so on.

Little attention has been paid to factors which often shape, determine and transform social structure by a conscious and sometimes carefully considered act of will. Chief among these is the political system and its national, local, regional, and international ramifications. This disregard of politics is even more striking since the evidence concerning the role of the state as a *demiurg* of social structure is so overwhelming from ancient societies until the present and since several sociologists, in Eastern Europe and in the West, have recently addressed themselves to this problem.

S. Ossowski, for example, has stressed that "in past capitalist societies the division of national income, the rise of privileged or underprivileged groups, and the membership of these groups has been, to a considerable extent, the result of deliberate decisions by the political authorities." W. Wesolowski has emphasized that "in a socialist society the uneven distribution of goods in high demand is mediated by the mechanism of governmental decisions." He called this "the government's role as a direct regulator."

In 1916, N. Bukharin, then a young Bolshevik leader, wrote on the three stages of the *capitalist* state. In the first, the state is the instrument of the dominant class. In the second, it becomes one institution among many, since other capitalist organizations have developed. At the third stage, "the state absorbs the organizations and again becomes the overall organization of dominant class . . . [its] iron organization with prehensile paws seizes the living body of society." The dominant role of the state in all social matters is indeed also a central theme of the leftist critics of the Soviet social system, from the Yugoslav school which refers to Soviet "statism," to such Western writers as M. Harrington who sees the Soviet system as one of "bureaucratic collectivism."

In Russian history there has been a long tradition of the state in the role of a *demiurg* of social structure. With his oprichnina policy, Ivan

the Terrible consciously undermined the strength of the independent *boyars* and made them dependent on the royal house of Muscovy. Peter the Great broke the exclusive power of this social group [the *boyars*] altogether and laid the foundation for the more modern and Westernized landlord and state-service class of the nobility [*dvoryanstvo*]. Catherine the Great continued this process. She made membership in the nobility dependent upon service to the court rather than noble lineage. Alexander II made social history through his edict which abolished serfdom in 1861. Stolypin tried to engineer the creation of a rich farmers class which would be a social base for Tsarism. The Tsarist system also created and maintained the state, army and police bureaucracies as special social castes [*chinovniki, ofitserstvo*], with a heirarchical order of positions, salaries, privileges, and status. The Soviet regime did not begin from scratch in this matter. At first, it tried to abolish this well-established tradition; then it reversed its position and intensified it.

5. RELATIONSHIP TO EDUCATION AND TRAINING

Education and vocational training appear as an important determinant of the social status of persons and groups. Some studies seem to show that education and training have the highest ratio of correlation with occupation, income, and social status. This is not always so. Under Soviet conditions, it may be clearly seen in the case of the so-called *praktiki*, people who have had no formal specialized education but who actually work in positions which demand a college degree, there are also the so-called "workers with higher education"—those who completed at least some study at college level but nonetheless fulfill the jobs of skilled workers.

Historically, social classes also develop methods and *institutions for socialization, education and training* which are specific for the given class. They frequently establish traditional preferences for recruitment and selection as well. The widely ramified system of special Party schools and army and security training establishments may be regarded as a manifestation of the class nature of the social groups for which these institutions prepare a new generation. On the other hand, the vocational-technical schools and the tractor and combine-drivers school are clearly directed to produce a replenishment for the skilled strata within the working class and the *kolkhoz* and *sovkhoz* peasantry, respectively. The colleges and secondary special schools are the primary instruments for the production of specialists or the intelligentsia proper. The preferences and criteria applied in enrollment to any of these greatly reflect the values and psychology of the Soviet educated strata. This, in turn, determines to a large degree the social composition of the student body, i.e., the future elite groups.

D. Conclusion: New Differentiation and Complexity Rather than Uniformity and Homogeneity

Much of Soviet sociological literature is, naturally, occupied with asserting that Soviet society is developing toward ever greater homogeneity and uniformity; it is becoming simpler and more egalitarian. This is official party dogma, and proving that it is "right" is a pre-

scribed duty for everyone. Yet, the actual material of sociological research often proves the opposite. Like any other highly industrialized society, Soviet society is developing new complexities and new forms of social differentiation in place of the old. Some of the bolder Soviet sociologists actually state this as a conclusion of their research. Shkaratan, for example, speaks about "contradictions between people employed in socially non-uniform labor, which are re-created on the basis of socialism."

As a result of the sociological debate, a new picture of Soviet society as possessing a highly stratified and complex nature is emerging. The sociological debate shows that the basic cleavages and problems in Soviet society are not confined to those that are officially recognized. For example, official theory speaks about a cleavage between two types of labor alone: mental and physical. Yet V. Semenov introduces a third type that he calls "service labor." Volkov speaks about a division between organizational and performing labor that corresponds to two categories of people: those who make decisions and those who have to execute them. Rutkevich introduces a division between specialists and white collar based on the level and kind of *education*. Instead of the previous official picture, which was basically unidimensional (forms of ownership), a multidimensional image of stratification is gradually appearing. In order to achieve a homogeneous society it is admitted that it is not sufficient to abolish the difference between forms of ownership. Instead, it will be necessary to equalize the educational attainment, conditions of labor, conditions of every-day living, and level of political participation of the whole population—which is by no means as simple.

A significant, yet usually overlooked, feature of Soviet writing today is that it does not speak about achieving a *classless* society in the communist future. Instead, "a socially homogeneous society" is to be achieved. This may be related to the new awareness of the complexities of social differentiation and stratification beyond the class divisions themselves. As so many of the Soviet sociologists rightly point out, to achieve a "homogeneous society" not only class differences will have to be overcome, but also intra-class differences and all other forms of meaningful *social* differences—e.g., those between town and country, mental and physical labor, etc.

Soviet scholars and official ideologues alike assert that some forms of social differentiation—e.g., between mental and physical labor—will remain even under communism, or at least during its first stages. Many of the sociologists show that a *new* differentiation appears *on the basis of socialism*, and that intra-class differences have become more important than inter-class differences. Even according to Soviet official theory, therefore, the projection seems to be that even if Soviet society becomes officially "classless" in the foreseeable future (e.g., when the kolkhozy and the state enterprises are units of the same ownership type), it will remain a highly differentiated—and therefore stratified—society. To quote Arutyunyan once more: "Class structure does not coincide with social structure. The latter can exist even in a classless society. [Therefore,] the creation of a socially homogeneous society pursues a twofold course—the elimination of both inter-class and intra-class differences."

Even "communist society" will be a socially differentiated society, i.e., it will have a social structure, social (upward and downward) mobility, etc. Since under socialism the intra-class differences are even more meaningful than the class differences, differentiation in early communist societies will also be quite meaningful. As a result, the arrival of the "homogeneous society" is officially projected into the rather indefinite future.

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Part II. RESOURCE CLAIM OF SOVIET MILITARY ESTABLISHMENT

METHODOLOGICAL PROBLEMS COMPARING THE U.S. AND U.S.S.R. ECONOMIES

By ROBERT W. CAMPBELL, M. MARK EARLE, JR., HERBERT S. LEVINE, *and* FRANCIS W. DRESCH

CONTENTS

I. INTRODUCTION [1]

Considerable use is made of U.S. and U.S.S.R. economic comparison data to support statements about U.S. national and defense policies. Often the use of such data is based explicitly or implicitly on the following persuasive but incomplete reasoning:

[1] Cf. Robert W. Campbell, "Problems of United States Economic Comparisons", Joint Economic Committee. *Comparisons of United States and Soviet Economics*, Part I, GPO 1959, pp. 13–21.

A larger GNP reflects a greater potential to initiate or expand programs relating to satisfaction of national objectives. Therefore, if Soviet GNP were bigger than U.S. or were increasing at a rate greater than U.S., the U.S.S.R. could execute options to the comparative disadvantage of the United States.

A relationship exists between military capability and expenditures on national security such that higher levels of expenditures result in increased military capability. Therefore, if Soviet NSE were "bigger" than U.S. or increasing at a rate greater than U.S., the USSR would achieve a defense posture superior to the United States whether measured in terms of political utility or warfighting capability.

While R.D.T. & E. outputs cannot be measured directly, a relationship exists between expenditures on input factors and resultant output such that higher levels of expenditures result in a greater scientific and technological capability. This capability moreover is linked to the deployment of military forces and, in turn, military capability. Therefore, if Soviet R.D.T. & E. expenditures were "bigger" than U.S., over time the U.S.S.R. would have a greater number of force improvement options than the United States and would achieve a defense posture superior to the United States whether measured in terms of political utility or warfighting capability.

Comparison of relative sizes must be used with caution—problems are encountered in developing the estimates which limit their accuracy, and conceptual problems inhibit their ability to provide the desired policy insights. This paper contributes to the understanding of the above by:

Giving preliminary estimates of selected U.S./U.S.S.R. economic aggregates;

Interpreting them in light of data and theoretical considerations;

Discussing the use of economic comparisons in the analysis of selected defense policy issues;

Commenting on the state of the two economies to provide a basis for interpreting future resource allocation decisions; and finally

Presenting observations on what can be drawn from U.S./U.S.S.R. comparative economic studies at this time for defense policy analysis.

II. Estimates of U.S. and U.S.S.R. Economic Aggregates

The economic aggregates that are the objects of comparison are defined in brief as follows:

GNP (Gross National Product)—the value of output of all final goods and services, as traditionally defined in Western countries.

NMP (Net Material Product)—the value of net tangible material output, which is the Soviet conception of national income and which differs from GNP in that capital consumption allowances and certain "unproductive" kinds of services are excluded.

NSE (National Security Expenditures)—the sum of DOD, AEC, and NASA expenditures or their Soviet equivalents.

R.D.T. & E. (Research, Development, Test and Evaluation)—expenditures by government and private industry on basic and applied research in the sciences and engineering, including the design, development, test, and evaluation of prototypes and processes, plus expenditures on R&D plant and facilities.

National Security Related R.D.T. & E.—those R.D.T. & E. expenditures, as just defined, relating to national security purposes.

A survey of the comparative economic literature reveals differing estimates of these aggregates, although the lack of consensus is much greater for estimates of U.S.S.R. economic activity than for the United States. Analysis of the underlying methodologies and source data is impossible for most of the estimates due to lack of documentation. Moreover, the time periods covered by the estimates are not uniform, thus further complicating the systematic evaluation of differences between the estimates and interpretation of U.S./U.S.S.R. comparisons.

As a result, Stanford Research Institute (SRI) estimates were pre-

pared and are given in Tables II–1 to II–4. The SRI estimates should be treated as preliminary, given the major computational problems encountered in calculating the Soviet estimates. Estimates by others for selected years are also included, but no attempt is made to document the differences indicated. Special note should be made of the impact of using different ruble/dollar ratios in converting rubles to dollars and the different results obtained when comparisons of aggregates are made in rubles rather than dollars.

TABLE II-1.—COMPARISONS OF UNITED STATES AND SOVIET GNP

Source and year	Soviet GNP in rubles (billions)	Conversion ratio (rubles/dollars)	Soviet GNP in dollars (billions)	U.S. GNP in dollars (billions)	Ratio U.S.S.R./U.S. (percent)
COMPARISONS IN DOLLARS					
SRI:[1]					
1955	119.3	0.65	184	398.0	46
1965	246.2	.60	410	684.9	60
1968	324.3	.61	532	864.2	62
1970	376.6	.59	638	974.1	66
ACDA:[2] 1970	([3])	([3])	497	974.1	51
Department of Commerce[4] (1971 dollars):					
1968	([3])	([3])	497	1001.0	50
1970	([3])	([3])	551	1023.0	54
Bornstein:[5] 1955	128.6	.61	212.4	397.5	53
	U.S. GNP in dollars (billions)	Conversion ratio (rubles/dollars)	U.S. GNP in rubles (billions)	Soviet GNP in rubles (billions)	Ratio U.S.S.R./U.S. (percent)
COMPARISON IN RUBLES					
Bornstein:[5] 1955	397.5	1.20	480.2	128.6	27

[1] F. W. Dresch, W. T. Lee, M. M. Earle, et al., "A Comparison of U.S./U.S.S.R. gross national product, national security expenditures and expenditures for R.D.T. & E.," SSC-TN-2010-1, SRI, Strategic Studies Center, Menlo Park, Calif., pp. V-5, VI-5 (December 1972).
[2] U.S. Arms Control Disarmament Agency, "World Military Expenditures, 1971," Washington, D.C., pp. 10, 11 (1972).
[3] Not available.
[4] P. G. Peterson, Secretary of Commerce, "U.S.-Soviet Communist Relationships in a New Era," Department of Commerce, Washington, D.C., p. A-4 (August 1972).
[5] M. Bornstein, "A Comparison of Soviet and United States National Product," in M. Bornstein and D. R. Fusfeld, eds., "The Soviet Economy, A Book of Readings," p. 283 (Richard Irwin Press, Homewood, Ill., 1962; revised edition, 1966).

TABLE II-2.—COMPARISONS OF UNITED STATES AND SOVIET NMP

Source and year	Soviet NMP in rubles (billions)	Conversion ratio (rubles to dollars)	Soviet NMP in dollars (billions)	U.S. NMP in dollars (billions)	Ratio U.S.S.R./U.S. (percent)
COMPARISONS IN DOLLARS					
SRI:[1]					
1958	127.7	0.62	206	283.9	73
1965	193.4	.60	322	422.0	76
1970	289.6	.59	491	563.8	87
Central Statistical Agency[2] (TsSU S.S.S.R.):					
1965	192.6	[3].78	248	401.0	62
1970	289.6	[3].76	381	579.0	66

[1] F. W. Dresch, W. T. Lee, M. M. Earle, et al., "A Comparison of U.S./U.S.S.R. gross national product, national security expenditures and expenditures for R.D.T. & E.," SSC-TN-2010-1, SRI, Strategic Studies Center, Menlo Park, Calif., pp. V-5, VI-6 (December 1972).
[2] Tsentral'noye Statisticheskoye Upravleniye pri Sovete Ministrov S.S.S.R., "Narodnoye Khozyayatvo S.S.S.R. v 1965 Godu. Statisticheskiy Yezhogodnik" (Statistika, Moskva, 1966) pp. 87, 589 [The National Economy of the U.S.S.R., 1965, Statistical Yearbook.] —, N. Kh. 1970, pp. 85, 533.
[3] Implicit.

TABLE II-3.—COMPARISONS OF U.S. AND SOVIET NSE

Source and year	Soviet NSE[1] in rubles (billions)	Conversion ratio (rubles/dollars)	Soviet NSE in dollars (billions)	U.S. NSE in dollars (billions)	Ratio U.S.S.R./U.S. (percent)
COMPARISONS IN DOLLARS					
SRI:[2]					
1955	12.5	0.42	29.4	40.2	73
1965	22.5	.50	45.5	57.7	79
1967	29.0	.52	56.3	81.2	69
1968	32.5	.52	61.9	86.1	72
1970	39.0	.52	74.3	82.4	90
ACDA:[3]					
1967	(4)	(4)	50.0	75.4	66
1970	(4)	(4)	65.0	77.8	83
SIPRI:[5]					
1967	14.5	.42	34.4	75.4	46
1970	17.9	.42	42.6	77.8	55
Cohn:[6]					
1955	11.5	(4)	(4)	(4)	(4)
1967	19.4	(4)	(4)	(4)	(4)
Boretsky:[6] 1968	(4)	(4)	84.0	78.0	108
Bornstein:[7] 1955	14.5	.4	36.2	38.4	94
Department of Commerce:[8] 1971	(4)	(4)	70.2	70.0	100
Central Statistical Agency[10] (TsSU S.S.S.R.):[11]					
1965	17.1	[2].5	34.2	[9]57.7	59
1970	24.5	[2].52	47.1	[9]82.4	57

	U.S. NSE in dollars (billions)	Conversion ratio (rubles/dollars)	U.S. NSE in rubles (billions)	Soviet NSE in rubles (billions)	Ratio U.S.S.R./U.S. (percent)
COMPARISON IN RUBLES					
Bornstein: 1955	38.4	.5	19.2	14.5	75

[1] Soviet NSE in dollars calculated using unrounded ruble/dollar ratios.
[2] F. W. Dresch, W. T. Lee, M. M. Earle, et al., "A Comparison of U.S./U.S.S.R. Gross National Product, National Security Expenditures for R.D.T. & E.," SSC-TN-2010-1, SRI Strategic Studies Center, Menlo Park, Calif., pp. V-5, VI-11 (December 1972).
[3] U.S. Arms Control and Disarmament Agency. "World Military Expenditures, 1971," Washington, D.C., pp. 18, 19 (1972).
[4] Not available.
[5] Stockholm International Peace Research Institute. "World Armaments and Disarmament," SIPRI Yearbook, pp. 84, 85 (1972).
[6] Joint Economic Committee. "Economic Performance and the Military Burden in the Soviet Union," U.S. Government Printing Office, Washington, D.C., pp. 168, 220 (1970).
[7] M. Bornstein, "A Comparison of Soviet and United States National Product," in M. Bornstein and D. R. Fusfeld, eds., "The Soviet Economy, A Book of Readings," p. 283 (Richard Irwin Press, Homewood, Illinois, 1962; revised edition, 1966).
[8] P. G. Peterson, Secretary of Commerce, "United States-Soviet Communist Relationships in a New Era," Department of Commerce, Washington, D.C., p. A8 (August 1972).
[9] U.S. Government.
[10] Tsentral'noye Statisticheskoye Upravleniye pri Sovete Ministrov S.S.S.R., "Narodnoye Khozyayatvo S.S.S.R. v 1970 Godu. Statisticheskiy Yezhogodnik" (Statistika, Moskua, 1971, pp. 730 [The National Economy of the U.S.S.R., 1970, Statistical Yearbook.]
[11] Soviet ruble estimates for defense and science converted to dollars using SRI conversion ratios to indicate the possible consequences of accepting published Soviet data.

TABLE II-4.—COMPARISONS OF UNITED STATES AND SOVIET R.D.T. & E.

Sources	Soviet R.D.T. & E. in rubles (billions)	Conversion ratio (rubles/dollars)	Soviet R.D.T. & E. in dollars (billions)	U.S. R.D.T. & E. in dollars (billions)	Ratio U.S.S.R. United State/ (percent
COMPARISONS IN DOLLARS					
SRI:[1]					
1955	2.0	0.39–0.56	$3.6–$5.6	$6.7	54–84
1960	5.5	.44–.62	8.9–12.5	14.6	61–86
1965	9.7	.47–.66	14.7–20.6	21.9	67–94
1967	9.9	.47–.66	15.0–21.1	24.9	60–85
1970	15.3	.47–.66	23.2–32.6	28.2	82–116
Kozlowski:[2] 1967	8.2	.33	24.8	(3)	(3)
Harvey:[4]					
1971	13.2	(3)	(3)	(3)	(3)
1972	14.4	.48	30.0	(3)	(3)
Government Accounting Office:[5]					
1960	3.8	.50	7.6	(3)	(3)
1965	7.0	.50	14.0	(3)	(3)
SIPRI:[6] 1960–69 average	2.2	.35	6.3	(3)	(3)
Central Statistical Agency:[7]					
1965[8]	4.3	.47–.66	6.5–9.1	21.9	30–42
1970[8]	6.5	.47–.66	9.8–13.8	28.2	35–49
(TsSU SSSR):[9]					
1965[10]	6.9	.47–.66	10.5–14.7	21.9	48–67
1970[10]	11.7	.47–.66	17.7–24.9	28.2	63–88

F. W. Dresch, W. T. Lee, M. M. Earle, et al., "A Comparison of U.S./U.S.S.R. Gross National Product, National Security Expenditures and Expenditures for RDT&E," SSC-TN-2010-1, SRI, Strategic Studies Center, Menlo Park, California, pp. V-5, VI-16 (December 1972). (It should be noted that the USSR RDT&E ruble estimate and ruble (dollar conversion ratio used in TN-8974-1 differ from those independently estimated by W. T. Lee.)

[2] J. P. Kozlowski, "R&D in the USSR," Science and Technology, No. 87, p. 10 (March 1969).

[3] Not available.

[4] M. L. Harvey, L. Goure, and V. Prokofieff, "Science and Technology as an Instrument of Soviet Policy," pp. XII and XIII (Center for Advanced International Studies, University of Miami, Coral Gables, Florida).

[5] The Comptroller General of the United States, "Comparison of Military Research and Development Expenditures of the United States and the Soviet Union" (Washington, D.C., July 23, 1971).

[6] Stockholm International Peace Research Institute, "World Armaments and Disarmament," SIPRI Yearbook, p. 58 (1972). SIPRI data is military only.

[7] Tsentral'noye Statisticheskoye Upravleniye pri Sovete Ministrov S.S.S.R., "Narodnoye Khozyayatvo S.S.S.R. v 1970 Godu. Statisticheskiy Yezhogodnik" (Statistika, Moskva, 1971) pp. 732, 734 [The National Economy of the USSR, 1970 Statistical Yearbook.]

[8] Ruble data for science.

[9] Soviet ruble estimates converted to dollars using SRI conversion ratios to indicate the possible consequences of accepting published Soviet data.

[10] Ruble data for science from all sources.

III. Interpretation of the Comparison of Economic Aggregates

A. Data and Computation Problems: How Accurate are the Numbers?

1. ESTIMATING U.S. ECONOMIC AGGREGATES

The U.S. estimates used in the SRI and in most comparative economic studies are derived from official publications of departments or agencies of the U.S. Government. The primary sources are: national income account data prepared by the Bureau of Economic Analysis (BEA) of the Department of Commerce;[2] NSE data from the Budget of the United States, and R.D.T. & E. data from the National Science Foundation (NSF). For GNP and NSE the only computational problems are the use of moving averages to change fiscal year data to a calendar year basis for comparability with the U.S.S.R. estimates and the use of deflators to convert current to constant dollars.

The NSF compiles two R.D.T. & E. series: one based on surveys of performers, the other developed from R.D.T. & E. expenditures reported by federal agencies. The performer survey data has been used

[2] Formerly known as the Office of Business Economics (OBE).

in the SRI analysis of U.S./U.S.S.R. comparative expenditures on R.D.T. & E. because its coverage is thought to be more complete than the federal expenditure data.

One of the major limitations in determining total expenditures for defense related R.D.T. & E. is the lack of adequate data relating to the funding that may have been contributed by private industry. Preliminary estimates for 1968 have been made of this contribution using a model developed by SRI for this purpose. These estimates indicate that the sum for that year of DOD, AEC, and NASA expenditures on R.D.T. & E. may understate total national security R.D.T. & E. by as much as 5 percent.

The major computational problem in developing U.S. R.D.T. & E. estimates relates to the choice of a deflator to derive a constant dollar series. Available deflators include: (a) that for government purchases of services (from BEA); (b) one developed by two DOD analysts, Augusta and Snyder, from DOD contract data; and (c) one developed by Helen Milton of the Research Analysis Corporation. In general the Augusta/Snyder index is preferred being based on more extensive analysis of DOD activities than the others. The greatest differences among the estimates in 1968 constant dollars occur at the beginning of the period under study—i.e., near 1955. Using the Milton index, the estimate for 1955 is $14.7 billion; using the Augusta/Snyder index yields an estimate of $12.3 billion; and using the government index yields an estimate of $11.6 billion.

2. ESTIMATING U.S.S.R. ECONOMIC AGGREGATES

The U.S.S.R. does not publish data for GNP, NSE, and R.D.T. & E. as defined for this study. Therefore it is necessary to develop methodologies to estimate these economic aggregates using Soviet source materials.[3]

The quality, reliability, and interpretation of Soviet data, as well as the price structure in the Soviet Union, must be taken into consideration in an assessment of the accuracy of the U.S.S.R. estimates developed. First, only very general information is available on the derivation methods of Soviet data, and Soviet data published in open literature is often lacking in definitive description. Second, a variety of pricing systems are in use in the Soviet Union, a fact which further complicates data interpretation. Third, the applicability of official Soviet indexes for reduction of the data to a common price base, or for the calculation of certain components of the economic aggregates, is questionable. Sufficient evidence is available to indicate a general upward trend in prices, although the Soviets report a declining price index for the Machine Building and Metal Working (M&MW) sector. Moreover, many Soviet and Western specialists question the accuracy of indexes based on so-called "constant 1955 prices," which are a composite of current and constant prices. And, finally, no information is available on the ruble pricing of the military and space hardware.

[3] The basic methodologies for estimating U.S.S.R. NSE and expenditures on R.D.T. & E. were developed by W. T. Lee.

GNP is estimated following Becker[4] by summing components of end, or final, use: investment, consumption, government administration, and national security. Published data for major components are adjusted slightly (e.g., to eliminate areas of overlap), but the estimates with greatest relative uncertainty concern only minor components. The uncertainties in the GNP estimates are dominated by those in the NSE estimates, because NSE is a major component, about 10 percent of GNP. The NMP estimate has been taken directly from Soviet sources in current and (except for the period 1955–1957) in constant rubles. The ratio of the current to the constant NMP ruble estimates provides an estimated NMP deflator. This has decreased slightly since 1957, which seems anomalous in view of other Soviet price data which have generally risen.

The SRI estimate of U.S.S.R. NSE is the sum of four major components: national security durables; military personnel pay and maintenance; operating and maintenance costs of the military establishment and of the space programs; and capital investment in military R. & D. plant and in military facilities and installations. The estimate of Soviet spending for durables (approximately two-thirds of the total NSE) is based on the assumptions that (1) the gross value of the output (GVO) of the Machine Building and Metal Working (M&MW) sector, as it has been reported, includes the production of military and space equipment and much of the development work on new kinds of hardware, and (2) the residual obtained after subtraction of all identifiable nonmilitary items[5] from the reconstructed GVO of M&MW is the procurement cost of M&MW NSE durables.

The major uncertainties of the estimate of U.S.S.R. NSE relate to: (1) the possibility that the residual which is interpreted as NSE durables, obtained from the disaggregation of the GVO of M&MW, contains other (unknown) components; (2) the possibility that certain durables for national security may have been included elsewhere; (3) limitations in the procedures used to obtain the remaining three major components of NSE—their sum constitutes approximately one-third of the total NSE[6]—and (4) conversion of data from one type of price basis to another by the use of questionable Soviet indexes.

Two methods were developed to estimate the R.D.T. & E. outlays by the U.S.S.R.: an "output method" (based primarily on the cost of manufactured prototypes, associated R. & D. expenditures, and capital outlays) and an "input method" (based on the cost of all inputs to R.D.T. & E. programs, such as labor, materials, and capital outlays). Problems exist in developing Soviet estimates covering the same

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[4] Abraham S. Becker, *Soviet National Income 1958–1964*, National Accounts of the U.S.S.R. in the Seven Year Plan Period (University of California Press, Berkeley & Los Angeles, 1969).

[5] GVO of metalworking, capital repair of machinery and equipment in the M&MW sector intermediate products in the Machine Building (MB) sector, capital repair, increment to unfinished production, exports, producer durables—net of imports, and consumer durables.

[6] The estimate of military personnel pay is based on the estimated 1958 average military pay rate (Source: N. Nimitz) and on the Soviet index for average wages of workers and employees. Military personnel maintenance cost is based on the estimated 1958 average military maintenance rate (Source: N. Nimitz) and on the average of Soviet wholesale price indexes for the Light and Food industries. Based on U.S. experience, operations and maintenance costs are estimated at 10 percent of the sum of the reconstructed durables and military personnel outlays. Capital investment in military facilities and military R. & D. plant was estimated by doubling the value of capital investment in R. & D. plant, which itself is derived from two budget entries, Science and Financing the National Economy (FNE).

R.D.T. & E. activities as those of the United States. For example, both of the methods omit the cost of test range operation and maintenance for which no Soviet data is available and no satisfactory U.S. analog factors have been developed by SRI.

The "output method" sums the following estimated components: cost of prototype hardware, cost of R. & D. performed in academies and institutions of higher education, and R. & D. capital outlays including capital repair. The key assumptions underlying this method are: (1) the GVO of the M&MW sector includes almost all the cost of prototype production; (2) the estimate of the prototype fabrication cost is the difference between the GVO of the M&MW sector and an estimate derived by summing the costs of M&MW factory production; [7] and (3) the reported M&MW employment does not include the research personnel. The major uncertainties of this method concern the validity of the second and third assumptions and the possibility that a portion of the prototype hardware cost is external to the M&MW sector.

The "input method" sums the estimated R&D outlays for wages and social insurance, personnel support and administration, materials, and capital outlays including capital repair. The main assumption of this method is that there is no significant overlap between the calculated wage bill of the R.D.T. & E. personnel and the estimate of materials. The major weakness of the "input" method concerns the estimate of materials, which could include a part of the wage bill and does include materials used in adminstration.

The "output" method is based on very limited data. The evidence supporting the assumption that prototypes are included in the GVO of the M&MW sector is better than the evidence supporting the reconstruction of the GVO for the M&MW factories. However, more research is needed on both assumptions. The "input" method is less controversial but the estimate obtained may be high because of the possible overstatement of material inputs which constitute from 40 to 45 percent of the total. It is not known what fraction of this input should be subtracted to correct for materials used in administration or for double counting of wages. The input estimates are overstated at least by the amount of the materials used in administration. Since the "input" estimates exceeded the output estimates for all years except for the period 1961–1964 inclusive, only the output estimates are shown in this paper.

As a result of data and procedural uncertainties, the accuracy of the U.S.S.R. estimates decreases as one proceeds from NMP to GNP, NSE and finally to R.D.T. & E.

3. ESTIMATING RUBLE-TO-DOLLAR CONVERSION RATIOS [8]

Once the ruble estimates have been prepared they must be converted to dollar magnitudes. There are four factors at work to change the ruble/dollar ratios over time. These factors are:

Different inflation rates in the two countries.

[7] M&MW factory production is based on estimates of the M&MW factory wage bill, other production costs and profit margin allowances.

[8] This section extracted in large part from F. W. Dresch, W. T. Lee, M. M. Earle, et al. "A Comparison of U.S., USSR gross national product, national security expenditures and expenditures for RDT&E." SSC–TN–2010–1, SRI, Strategic Studies Center. Menlo Park, Calif. Sections VB and C (December 1972).

Changes in individual ruble/dollar relatives; i.e., the prices of some goods produced both in 1955 and in 1970 may have changed in response to diverse patterns of resource allocations in the two countries.

Changes in the U.S. and Soviet product mix. For example, in 1970 the Soviet mix may contain more goods which had relatively high ruble/dollar ratios than in 1955.

Introduction of new products; i.e., the production in 1970 of goods which, because of the state-of-the-art, could not have been produced in 1955. Such new products may have quite different ruble/dollar ratios than the products produced in both countries in 1955.

It should be noted that these four factors may move in the same or in opposite directions as far as the effect on the ruble/dollar ratios is concerned. Moreover, the net effect of all four factors on the average ruble/dollar ratios for 1970 could vary for each of the major aggregates considered in this report.

The factors for converting these outlays into dollars continue to be based on empirical evidence which is more than 15 years old. In connection with the price changes effective 1 July 1955, the Soviet Government released volumes of commodity price lists (handbooks) which were laboriously compared to the prices of comparable commodities in the United States. The data released on U.S.S.R. prices since 1955 are scarce and very incomplete; the comparable price changes of mid-1967 were not accompanied by the release of voluminous price lists as in 1955. The basic reference work used for the 1955 ruble/dollar conversion data is a study by Morris Bornstein.[9]

In an attempt to expand the data on ruble/dollar ratios, a survey of the Western and Soviet literature on estimates of ruble/dollar ratios was made with the following major findings:[10]

With only a few notable exceptions, the methodologies employed by the various authors were not sufficiently documented to permit establishing the requisite set of ruble/dollar ratios for the purpose of this study.

Some fragmentary data were found in the Soviet literature indicating that the ruble/dollar ratios for investment and durables were higher in 1955 than Bornstein had estimated, and that the ratios in 1967–1970 may have been higher than in 1955.

Soviet and Western sources have raised serious questions about the validity of using Soviet price indexes (particularly those for M&MW) to adjust the 1955 ruble/dollar ratios to other years. The main reservations about Soviet price indexes relate to the methods used in their computation and the limited coverage of the samples.

In the absence of post-1967 ruble/dollar price relatives, no empirically verifiable ratios can be calculated for recent years. SRI estimates are based on plausible quantification of judgmental assessments of the four factors which influence the ruble/dollar ratios over time. In brief, it is concluded that the ratio for GNP has been dominated by the effects of different inflation rates in the two countries resulting in a constant or even declining ratio from 1955 to 1970. The 1955 value, however, is estimated to be slightly higher than that developed by Bornstein as a result of his use of investment ratios for military durables; i.e., Bornstein's estimates for both investment and defense are thought to be low for 1955.

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[9] M. Bornstein, "A Comparison of Soviet and United States National Product," in M. Bornstein and D. R. Fusfeld, eds., *The Soviet Economy, A Book of Readings*, p. 283 (Richard Irwin Press, Homewood, Illinois, 1962; revised edition, 1966).

[10] For further discussion, see A. Woroniak, "Ruble/Dollar Conversion Ratio Survey," SSC-TN-8974-54, SRI, Strategic Studies Center, Menlo Park, California (July 1972).

The ratio for NSE on the other hand is considered to have been dominated by changes in the product mix, particularly the introduction of new technologically advanced products so that the ruble/dollar ratios are estimated to have risen between 1955 and 1970.[11]

Converting R.D.T. & E. rubles to dollars lacks an empirical base, whereas in the case of GNP and NSE, the analysis of the 1955 data does provide a point of departure. In the absence of any empirical data on the ruble cost of prototype hardware, or of carrying out the development of an ICBM or of a spacecraft, two major assumptions have been used to postulate values for the R.D.T. & E. ruble/dollar ratios.

The 1955 ratio probably is higher than Bornstein estimated for either defense or investment as a whole.

Subsequently, the R.D.T. & E. ratio would have risen steadily as the Soviets fabricated increasingly more expensive prototype hardware required by their military R.D.T. & E. and space programs designed to satisfy Soviet objectives for "qualitative superiority" in the competition with the United States. Over the 16-year period this increase is estimated to be about 20 percent.

Because of the tenuous nature of the data upon which the above estimating assumptions are based, the SRI estimate is presented as a range rather than a single time series. Moreover, the focus on R.D.T. & E. hardware and its relation to investment goods incorporates directly with the SRI R.D.T. & E. ruble/dollar ratio subjective judgments about comparative R.D.T. & E. physical productivity.[12]

B. Conceptual Problems: What do the Numbers Mean?

However accurate the estimates of Soviet GNP, NSE, or R.D.T. & E. expenditures various researchers produce, and however precise their conversion into dollar magnitudes, there are a number of conceptual ambiguities and methodological crudities, common to all these numbers, that policymakers should keep in mind.

1. THE INDEX NUMBER AMBIGUITY

When two countries exhibit such differences in the composition of their output and in the relative costs of different kinds of output as the U.S.S.R. and the United States do, there is an inherent ambiguity in the question how big one country's output is compared to that of the other. Because the two aggregates involve such different mixes of guns and butter, it is necessary to interpret the summary comparison represented by "how many dollars worth of output does each produce" as standing for something independent of what combination of things is being produced—some kind of abstract, general, production potential which will serve as a common denominator to which *any* kind of output can be reduced. Because the price structures are so different, however, the result of phrasing the question about relative production potential alternatively as "how many rubles worth of output could each country produce" is to show Soviet production potential as much

[11] Assuming that the other factors are offsetting or minor in their impact, for the ratio to rise the dominant factor must be that the cost to the Soviets to introduce their new technology products is proportionally higher than the cost to the U.S. to introduce its new technology products.

[12] The judgment relative to comparative R.D.T. & E. productivity based on R.D.T. & E. hardware does not give full consideration to relative U.S.S.R./U.S. R.D.T. & E. productivity based on output of knowledge.

smaller in relation to U.S. potential than did the dollar comparison.[13] It may not even be possible to say unambiguously which country's output represents the larger production potential. And although there may be some special reason to distrust the ruble comparison since the ruble prices are very inaccurate measures even of costs in the Soviet economy, there is no basis for accepting the dollar comparison as the right answer. The ambiguity is inherent in the question, and cannot be wished away.

2. DEFENSE OUTPUT MEASURED AS A MIXTURE OF INVESTMENT AND CURRENT INPUTS

In comparative studies of U.S. and Soviet output, the convention is to treat the contribution of the defense establishment to the total output of the society (and its drain on production potential) as the sum of (a) additions to its capital stock (i.e., its stock of missiles, submarines, and other such military durables) and; (b) its current consumption of such inputs as labor services, fuel, and repair parts. This convention ignores the fact that the defense sector holds a very large stock of capital, the size of which is crucial in determining how much defense or security the defense establishment produces. This convention is followed largely because it is very difficult to get some direct measurement of the output of the defense sector, but there can hardly be any argument that, whatever security the defense establishment produces, it is the joint product of the current inputs and the capacity that comes from having a large stock of capital in place. This convention may be perfectly innocuous when the central concern is what share of society's output is currently being channeled away from consumption or investment in order to serve military ends, but it makes the figures for national security expenditures inappropriate for dealing with questions of the total size of resources going into the defense capabilities of each country in a given year, or how much either's defense potential has grown over time.

3. HOW WELL DO ESTIMATES OF GNP REFLECT PRODUCTIVE POTENTIAL?

Apart from the ambiguities of the index number problem, the use of comparative Soviet and U.S. output in some given year as a surrogate for comparative production potential at that point depends on several simplifying assumptions that may not be met.

a. Assumptions about capacity

It is assumed that there is in fact some rather unambiguous upper limit to the amount that either society can produce with its available resources, and that resources are fully employed. But in reality every economy has a certain amount of slack, and there may be quite a differential between the U.S. and the Soviet economies in regard to how close they are to capacity at any given time and also under what kind of conditions and how rapidly they would move closer to their production frontier or away from it. If there is any asymmetry in these conditions, then the interpretation of comparative output as comparative production potential may be quite misleading.

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[13] See for example the Bornstein 1955 dollar and ruble comparisons in Tables II–1 and II–3.

b. Assumptions about reallocation and flexibility

Under the production potential concept, a statement that the Soviet economy is two-thirds as large as the U.S. economy is supposed to hold regardless of how either economy alters the mix of outputs which, as they are produced, draw on that production potential. This is equivalent to assuming that the two economies can trade off one kind of output for another at whatever ratios are implied by the relative prices used in valuing the output of the economies. Thus, if dollar values are used for both economies, in which a fighter plane is added in at $2 million and a tractor at $5,000, then the assumption is that either side has the option of producing fewer fighter planes and more tractors, sacrificing at each step of this shift 1 fighter plane for 400 tractors. Apart from the fact that this may not be the case because Soviet relative costs are not the same as the dollar prices in which the comparison is made, there is the further question of whether, as they move significantly to change the mix, the relative costs may not change appreciably. There may even be a question of differences in the two societies as to how much flexibility may exist over various time horizons for making these shifts at all. In the very short run it may simply not be possible to shift resources from the moon program to producing more beefsteak, and even in the longer run there may be increasing or decreasing returns.

c. Final vs. intermediate goods

Presumably we are interested in comparing the two countries' potential to produce final output—i.e., goods and services that can actually satisfy some goal which policymakers consider important to our competitive confrontation with each other, such as raising consumption levels, generating new technology that could be the basis for technological superiority, or the like. In comparing Soviet and U.S. output, steel output or timber output are not compared because these goods do not directly serve any final goal; they first have to be processed into something else—such as machines or buildings—that can satisfy some ultimate goal. And in the Soviet-U.S. case, steel or timber comparisons would be very misleading proxies for the final outputs which it is desired to compare since the Russians need more steel and timber than does the United States to make some final good or perform some final services.

Unfortunately, on either side, there is a large area of economic activity where prices and measures for the outputs are lacking, and the practice has been followed of including as output in national totals the cost of the inputs used in these activities. Education, health care, research and development, and defense are all examples. Within a given country this practice is justified by the argument that whoever controls these resource allocations (generally some responsible political body) must satisfy themselves that these resources produce an output that is worth what the resources cost. But in comparing aggregates for the United States and the U.S.S.R., this argument breaks down. Whenever both outputs and inputs can be measured, the Russians are shown as getting smaller amounts of output per unit of input than the United States, and there seems no reason to doubt that this would also hold in producing new technology, health care, educa-

tion, and defense. Moreover, investment is treated as a final good in national income accounting but it can be also be considered an intermediate good if the convention of a one-year accounting period is relaxed. This productivity difference, therefore, applies to a very large share of the totals being compared—say half of the total on the Soviet side. If each nation's output of *final* goods could be compared, the Soviet production potential would be smaller in relation to U.S. potential than in a comparison in which each aggregate contains a large proportion of intermediate goods. Unfortunately very little is known as to what kind of productivity corrections might be in order here, especially as there is a well-founded feeling that U.S.-Soviet productivity differentials vary considerably among these activities.

4. THE NEED FOR DYNAMIC COMPARISONS

Comparisons of economic aggregates are static rather than dynamic—they show where the Russians stand in relation to the United States at some point in time. The real motivation for the comparisons, however, is forward-looking. The real question is not what resources the Russians are putting into research, but whether they can attain technological superiority. And this involves not just the above mentioned question of productivity in performing various phases of research and development, but their ability to put new technology to work to make their economy perform better. Similarly, the size of their investment program is of interest largely because this is a determinant of future growth. But the growth payoff to investment is a dynamic question that can be answered only if a lot more is known about what is happening to the elasticity of substitution of capital for labor as the U.S.S.R. builds up its capital stock, and this is something that requires some dynamic treatment of the growth process as well as an assessment of comparative size. To an extent the succession of comparisons over time gives some flavor of this, but to be forward-looking a model is needed that looks explicitly at how some of these economic aggregates—investment, research, and development spending, machinery output (and its split between investment and military uses)— are related to the variables that are of interest in a dynamic competitive confrontation.

IV. Application of Economic Comparisons in the Analysis of Selected Defense Policy Issues

These ambiguities and difficulties in comparisons of economic aggregates are catalogued not as an exercise in economic theory but because they create serious pitfalls in using these numbers to answer defense policy questions. It is often easier to know how to deal with some of the ambiguities listed, or how seriously to take some of the problems, if one knows what questions the numbers are going to be used to answer. Four of the more commonly raised defense issues relating to comparative economics are discussed below.

A. The Question of Burden

The policymaker would like somehow to assess how heavy the burden of the Soviet military program is, as a clue to the motivations and fu-

ture behavior of the Soviet leaders and their possible reactions to U.S. initiatives. For example, it is often thought that the U.S.S.R. was induced toward SALT by economic pressures, and that the burden of their military program is an important guarantee that the Russians will continue to be serious about arms limitations. This conclusion flows naturally enough from four numbers that come out of comparisons—the two GNP's in dollars, and the dollar magnitudes of the two military programs. Soviet GNP is shown as being roughly two-thirds as big as U.S. GNP, and Soviet NSE expenditures approximately as big as those of the United States. Ergo: the burden, as measured by the share of GNP devoted to NSE, must be much greater for the U.S.S.R. than for the United States. Unfortunately, that does not follow at all. Looking at Soviet GNP in rubles, the Russians allot about the same share of GNP to defense as does the United States. This paradox is one of the corollaries of the index number ambiguity—because military hardware and other military inputs are much cheaper in relation to other kinds of output for the U.S.S.R. than for the United States, the amount of men's suits and other civilian goods the Russians are giving up to get a military program as big as the U.S. program is not nearly so great as it would seem on the basis of valuing their GNP and its components in dollars. Because the U.S.S.R. is comparatively much more efficient in producing military hardware than in producing men's suits, the share of its resources that must be committed to military uses in order to obtain their large military program is no more than the share the United States has to devote to it.

In drawing from these numbers any implications about the burden of defense expenditures, the issues of capacity utilization and transferability of resources are highly relevant. Suppose, for instance, that the issue is the differential ability of the U.S. and U.S.S.R. to handle some new program. In assessing the burden it poses, information is needed about its opportunity cost—the sacrifice of alternatives required. Yet depending on how close the two economies are to full utilization of capacity in different sectors, and what kind of macroeconomic policies are assumed to accompany the program—it might require the sacrifice of some other program, or it might come out of slack, i.e., unutilized capacity. The United States recently had the experience in which a cut in military expenditures came out more as an increase in unemployment than as an increment to civilian output.

For the Soviet side, this issue is often handled with a lot of assumptions, not always explicit, and to some extent mutually contradictory. One idea is that the Soviet economy is a high-pressure economy at full employment so that increases in NSE must represent a loss of civilian output. But at the same time most Soviet economic analysts believe that there is a lot of slack in the Soviet economy in the sense of underutilized resources. The problem may be that the Soviet policymakers lack the instruments to mobilize this slack or, to the extent that they can move to do so, the instruments required are not monetary and fiscal policy but economic reform, or trade, or some other such policy that may be more fundamental and more intertwined with other policy objectives than are the U.S. macroinstruments.

Whether the commitment of resources to a military program involves a burden on the economy depends also on whether it would be possible to use the resources for some other purpose. Again quantitatively, very

little is known, but it seems likely that the Soviet situation is quite different from that of the U.S. It is often held that the sector of the Soviet economy producing for space and military needs is quite distinct from the civilian sectors, and that it is difficult to shift resources back and forth between them. The two sectors operate on different technical levels, and according to quite different rules, and with a considerable secrecy barrier. It is clear that the leaders have had a very difficult time trying to transfer to the civilian sector the managerial techniques, the innovative behavior, and high quality that seem evident in the military and space sector. On the other hand, Brezhnev has stated that 42 percent of the output of the defense industry consists of civilian products, and according to the chairman of the U.S.S.R. Gosplan, N. K. Baybakov, the defense industry is being called on to make a significant contribution to increasing the output of consumer goods under the Ninth Five Year Plan. This should probably be interpreted in part to mean that it is difficult to get defense industry to work on civilian outputs.

It is also believed that the research and development sector shows a similar division, with the institutions assigned to military purposes working under different rules and motivatons, under the control of a customer who knows what it wants, and much more effectively than civilian R.D.T. & E. institutions. Under these conditions an effort to redirect the work of these teams and institutes to work on the goal of modernizing civilian technology will yield less new R.D.T. & E. output than expected given a shift in input resources. This is because these institutions would be hampered by the lack of direction, the confusion in criteria, and the unresponsiveness of the customers who would produce and use the new technology. If this is in fact the case, then keeping these teams and institutes at work on military research and development projects doesn't really involve any serious opportunity cost at all. All of these considerations are aspects of comparisons between the two economies equally important as the comparison of economic aggregates and subaggregates in assessing the burden of defense, but they are usually handled with assumptions that are not even stated, much less researched.

B. The Question of Military Potential

A second major concern is relative military potential or strength. This is not a simple concept, of course, since it is multidimensional, and also interdependent with the actions of the adversary. Comparative national security expenditures as usually estimated seem very inadequate for indicating relative strength. Moreover, these numbers have several weaknesses relating to their ability to reflect completely the resources devoted to NSE.

1. THE MIX OF CAPITAL GOODS AND SERVICES: U.S./U.S.S.R.

As indicated earlier these comparisons traditionally treat the output of the defense sector as the sum of inputs currently consumed and currently added to the stock of military hardware. It is obvious that the sector's output—whether it is thought of as strength or potential or security—is more a function of the stock of military hard-

ware than of the current additions to it. What matters is not how many missiles are being added to the stock, but how many are in place ready for use. Until a few years ago, comparisons of NSE considerably underrated the size of the U.S. effort compared to the Russian effort, because the United States had already built up a much bigger stock than the Russians had. But this situation has now changed, and the comparative strength has changed over time much more than would seem to be the case from looking at trends in comparative NSE of the two sides.

2. THE INDEX NUMBER PROBLEM: U.S./U.S.S.R. WAGE BILL FOR NATIONAL SECURITY

The index number ambiguity applies to comparisons of subaggregates as well as to GNP as a whole. Data are lacking to demonstrate it here, but there is no doubt that a ruble comparison of NSE would show an appreciably smaller U.S.S.R./U.S. ratio than do the dollar comparisons. The dollar comparison gives greater emphasis to the Soviet/U.S. manpower ratio and less to the Soviet/U.S. ratio for other inputs than would the ruble comparison. The rationale for adding together the dollar expenditures on different inputs in the U.S. program is that the last dollar spent on any kind of input contributes an equal amount to military strength. Indeed it is the responsibility of defense planners to see that this is the case. But since the Russians use a higher ratio of manpower to other inputs, it seems a mistake to attribute to all those soldiers the corresponding "dollars worth" of contribution to military strength that they get in the dollar valuation of Soviet NSE. They are no doubt worth the rubles the Soviet defense planners allocate to them, but the ruble cost per soldier is much less relative to the ruble cost of the other inputs than the corresponding ratio in the United States.

3. CAN THE OUTPUT OF NSE BE MEASURED?

When the question is the comparative strength produced, comparative NSE expenditures, however ingeniously they have been estimated and repriced in dollars, seem very poor material for providing an answer. This is a good illustration of the point that, by defining more precisely in advance what question the numbers are to help in answering, the conceptual ambiguities raised above can be treated more precisely. In this case, the implication would seem to be that if comparisons of NSE are desired, an effort should be made to reconceptualize the output of defense, disaggregate NSE to distinguish between currently consumed inputs and additions to the stock, and set up some explicit accounting of stocks to which the economic value could be imputed in line with that generated by capital elsewere in the economy. Reconceptualizing the output of defense means attempting through analysis of strategic interactions to develop weights with which to aggregate relative standings in manpower inputs, missile stocks, and other such forces into an overall relative. These weights ought not to be taken from either the ruble price system or the dollar price system, but from some knowledge of the contribution these forces make to some overall military capability.

C. The Question of Changing Priorities

The analysis of considerations relating to changing priorities raises essentially those issues discussed above under the section on the burden of defense. The ability to satisfy a new mix of national objectives is dependent on the degree of capacity being utilized and on the reallocation flexibility of the economies.

D. Comparative R.D.T. & E. Expenditures and the Drive for Technological Superiority

One of the most alarming concerns grows out of what these dollar comparisons show about relative expenditures on R.D.T. & E. Dollar valuations of Soviet military R.D.T. & E. programs generally show recent Soviet expenditures appreciably larger than U.S. expenditures; in combination with the generally held belief that more expenditures will produce more results, this raises the fear of technological surprise or the technological superiority the Russians claim they are seeking. The conceptual problems outlined previously enter here in two important ways.

1. EXAGGERATION THROUGH THE INDEX NUMBER EFFECT

First, this is a sector in which the index number ambiguity is probably fairly strong, although as far as is known no one has tried to estimate U.S. research and development expenditures in rubles for comparison with the Soviet totals. But the Russians use something like twice the manpower in research and development that the United States does, and considerably less of the other inputs. Since the price of manpower in relation to other inputs is much less in the ruble price system than in the dollar price system, the dollar comparisons risk over-valuing the input that the Russians use lavishly (to the point that its contribution at the margin is low) since it is cheap compared with other possible inputs into research and development.

2. PRODUCTIVITY OF R.D.T. & E. RESOURCES

This is also a sector where measuring inputs rather than outputs may generate quite erroneous conclusions. The index number ambiguity assumes that each country is using basically the same production function, but that it uses different combinations of inputs in response to different scarcity conditions. But there is an independent possibility: that the Russians are simply less efficient in doing research—i.e., that they operate with a production function for R.D.T. & E. that is less effiicent than the one the American economy operates with. Thus, even if they used exactly the same combination of inputs as the United States, they would get less in results. The utlimate issue is the amount of new technology that each country produces rather than the amount of inputs each country uses to attain this goal, and if there are serious differences in productivity, then some correction should be made of the comparative R.D.T. & E. figures that reflect inputs. The general point is commonly accepted, but in practice those who produce these numbers operate with widely varying assumptions about productivity, not always revealed and not all grounded in any research.

V. The Changing Environment for Future Policy Decisions: The State of the Two Economies

The problem of comparisons must be viewed in a dynamic perspective, thus it is useful to assess the state of the two economies.

A. The Soviet Economy: A Period of Transition

The Soviet economy is involved at the present time in a difficult transition, involving a shift in priorities, a shift in the allocation of output and in economic structure, and a transition to a new strategy of growth. The traditional Soviet growth strategy has been one of mobilizing big increases in inputs of capital and labor to ensure the continued growth of output. The demographic situation today does not allow the latter, and the former is made unattractive by very high incremental capital-to-output ratios. The high capital requirements under the old strategy made overall growth strongly competitive with military expenditures, and with increases in consumption.

The new strategy has several elements: (a) it alters the composition of output somewhat in favor of consumption; (b) as a first step in that direction, it shifts the composition of the investment program to more investment in industries producing consumer goods and less investment in industries producing investment goods; (c) it places a very heavy emphasis on productivity increases as a source of growth, which are in turn dependent on modernizing the technology of the civilian sectors of the economy and on improving the management of the economy.

Increased consumption should help to motivate productivity increases, but another reason for this shift is the lesson from Poland that if significant rises in consumption are not achieved, even a Communist regime may be faced with severe worker disturbances. Another possible interpretation worth exploring might be that since the U.S.S.R. has sharply altered its relative standing in military capital, relative military strength is now less directly related to current spending on procurement of weapons systems (as shown in comparative NSE) and more to existing stocks; they are, therefore, freer to contemplate a diversion of some of the capacity that has gone into producing military hardware into producing more modern equipment and machinery for the civilian sectors. This would mean that the Soviet military planning might also want to use the military R.D.T. & E. resources available to them differently than in the past, say to explore more speculative ventures, rather than concentrating them on development of well-defined systems to match and offset U.S. systems.

Also important to the strategy is an emphasis on trade to help ease some of the bottlenecks that accompany this shift in proportions and to help with the modernization goal through importing technology directly in the form of patients and licenses and indirectly as embodied in capital goods.

It is not at all clear how successful the Russians will be in making this transition. It is full of risks and uncertainties. In the past, outside the military sectors, they have never been very successful at innovation and technical progress, either in creating it domestically or in absorbing and mastering it through importation. The system has never been

very effective at getting the successful experience of the military and space sectors transferred to the task of rejuvenating the technology of the civilian branches. If the new strategy may ease the competitiveness of military programs with investment objectives, it would seem to exacerbate the competition for R. & D. resources between military and civilian purposes. Moreover, the Russians are seeking much larger productivity gains than they have hoped for in the past. They imply unprecedented success in the creation and absorption of new technology, radical improvements in managerial behavior, and breakthroughs in what have always been intractable problem sectors in the past, such as agriculture.

The total spending on R.D.T. & E. is such that even with a high share devoted to military and space programs the absolute amount left for civilian work is very large. If, of the SRI estimated $28 billion of Soviet R.D.T. & E. expenditures in 1970, only 60 percent is military the remaining $11 billion represents a handsome expenditure on behalf of civilian technology, considering that the analogous U.S. total was about $16 billion for a much larger economy. The obstacles to innovation in the civilian economy would thus seem to be related more to defects in organization and incentives than to the volume of R. & D. spending. The implications of this proposition are ambiguous, however. To get serious gains in civilian technology it may be necessary to call on the capacity of the organizations and facilities in the military sector that have produced results, in which case the military-civilian competition would be felt very directly and keenly. Alternatively the leaders may conclude that the emphasis should be on organizational and planning changes within the share of resources already allocated to civilian R.D.T. & E. Soviet planning documents and public statements do not as yet reveal how these R.D.T. & E. resource allocations problems are being resolved.

The goal of more trade carries with it many dilemmas. The problem of what to export must be a difficult one. The index number problem that bedevils economic comparisons implies as a corollary that there are plenty of export possibilities; the Russians have a comparative advantage in all those areas with low ruble/dollar ratios, such as machinery, investment goods, and industrial producer goods generally. Shifts in priorities also imply excess capacity in some heavy industry branches. It is often held that the Russians are not in fact competitive in this area due to durability problems, but it is interesting they have recently become very aggressive in selling products such as turbines and aircraft, and industrial plant. They also must have a strong commercial motivation to sell conventional weapons around the world, to utilize the excess capacity in the branches that have produced the present stocks of these weapons.

The Russians would like to make the program of modernizing the civilian sector through trade more or less self-financing; if so, it need not compete with the military for R.D.T. & E. and investment resources. The hope is to create new capacity on a high technical level, on credit, in those sectors where this capacity can provide directly the exports to pay off the debt. Oil and gas are the prime examples. This is one of those mixed competitive-cooperative interactions that will tax the ingenuity of policymakers on each side to extract for their side the largest possible share of the gains.

There is also the question of how effectively technology imports can solve the technical progress problem. There already exists a long history of Soviet borrowing of foreign technology, a history that suggests it is a far from costless process. It creates obstacles to learning how to innovate independently. Technological imports may give a much smaller impetus to productivity growth than expected—they may require better maintenance, new skills, and higher quality inputs than the Soviet economy normally supplies.

The risks of this transition strategy are revealed by the experience of the first two years of the Ninth Five Year Plan. The Russians have experienced a drastic failure in agriculture; growth as a whole has been considerably below the levels set in the Five Year Plan for the first two years; they have not succeeded in fulfilling many of the goals for consumer goods output. How the Soviet policymakers will react to these difficulties over the next couple of years is very important for a net assessment of U.S./U.S.S.R. relations. The hardline faction within the leadership could take the position that the new strategy is dangerous adventurism, that there must be a return to the old emphasis on heavy industries and defense industries, and that the country must not risk giving up the strong comparative position it has won in the military area and in defense R.D.T. & E. by frittering away its production potential on "unattainable" civilian and consumer goals.

As of now, the leadership seems to be holding to the transitional strategy. Faced with a failure in the agricultural program, the Soviets committed half a year's hard currency earnings for grain imports. Kosygin, however, is reported to have cautioned the planners that they must not expect to solve growth problems by big new infusions of capital and that they must stay within the amounts planned. The Central Committee met in December to discuss the Plan and Budget for 1973, and the plan as approved reaffirms the original strategy of the Five Year Plan. It reacts to the agricultural failure by saying that the effort in that sector should be increased, it reiterates the high priority of consumer goals, and the budget for 1973 specifies an allocation for military expenditures at the same level as for 1972. This need not be accepted as the true indication of what will happen to military spending, but this action is a significant symbolic action for internal purposes. They are still vigorously pursuing the trade aspect of the strategy. There are a few contrary indications regarding the viability of the strategy such as the greater fulfillment of producer-goods industry than of consumer-goods industry goals in the last two years, and in a sharp increase in the investment allocation to the steel industry for 1973. These differentials may, however, be explainable as results of the failure of input requirements to decline as hoped for.

B. The U.S. Economy: A Period of Accelerated Recovery [14]

If the Soviet economy seems to be engulfed in a set of problems associated with a transition to a new strategy for economic development, the U.S. economy seems to be recovering from the unsettled conditions of a different kind of transition, characterized by inflation, considerable unemployment of resources, fiscal pressures associated with the

[14] This section is based in large part on a discussion with Ross Preston on the pressure points in the American economy during the decade of the seventies.

Vietnam War, and adjustments caused by changing national priorities (e.g., as in government support of research and education).

The transition from the recession of 1969–1971 to the current period of accelerated growth was accomplished through the New Economic Policy (NEP), introduced in August of 1971. The NEP was a revolutionary and unprecedented program of government controls and stimulation for economic recovery. The three main problem areas advanced by the NEP were excessive wage and price increases, poor gains in worker productivity, and a worsening balance of payments.

Phase I of the NEP commenced on 15 August 1971, and was comprised of a ninety-day freeze on all wages and prices, termination of the convertibility of dollars held by foreign governments into gold held by the United States, imposition of a 10 percent surcharge on all imports, and demands for the reform of the international monetary system. Phase II provided for the establishment of control mechanisms for regulating wage and price increases, tax incentives for stimulating producer accumulation or capital goods, the reduction or elimination of those federally funded programs with low levels of productivity, and negotiations on the devaluation of the dollar relative to the currencies of trading partners of the United States.

Phase III of the NEP was announced on 11 January 1973. It lifts the mandatory wage and price controls of Phase II and substitutes a program which continues government surveillance of product and sector performance and enforces compliance through informal government pressure and the threat of reimposing Phase II controls. Certain "problem" areas (food, health and construction industries) of the economy will remain under the wage-price controls.

The improved performance of the economy since the introduction of the NEP has been encouraging. Real GNP (at 1958 prices) advanced at a rate of 6.5 percent, compared with the 2.7 percent rate of 1971. The unemployment level fell from the 6 percent-plus rate of 1971 to 5.2 percent by the end of 1972, a 27-month low. The Consumer Price Index at the end of 1972 was increasing at an annual rate of 3.5 percent, somewhat above the Administration's target rate of 3 percent.

While progress has been made toward the realization of the objectives of the NEP, there remain several areas where long-run problems persist. These pressure points are both external and internal in nature. They include: (a) the trade balance, (b) the tax base, (c) the government spending base, (d) the investment base, (e) labor market frictions, (f) energy demand, and (g) monetary management.

Of concern will be the impact the emerging energy crisis might have on the U.S. trade position during the decade. Domestic demand for energy and domestic energy supplies are already out of balance. During the decade this imbalance is anticipated to increase. Possible solutions to the energy crisis might involve a reconsideration of import restrictions on petroleum and liquified natural gas. Satisfying domestic energy requirements by dependence on foreign suppliers could, among other things, cause substantial trade deficits over the course of the decade. As a result, policy planners must realize the possibility does exist for a single commodity (petroleum) to swing the U.S. trade position by as much as 5 to 10 billion dollars over the course of the decade. This, in concert with the non-competitiveness of U.S. goods domesti-

cally and abroad due to recent problems of inflation in the United States, gives serious concern for the stability of the dollar during the decade.

The energy crisis may not only affect the U.S. trade position over the course of the decade, but might substantially increase the domestic price of energy. To date, restrictive measures which inhibit the operation of free market forces have led to excessive demands and short supplies in such areas as natural gas. A more realistic approach by regulatory agencies might suggest substantial increases in the price of energy as a result of these shortages. Given the underlying dependence of U.S. growth on cheap sources of energy, this could easily lead to possible bottlenecks in the growth process. Current thinking views the sources of growth as dependent on productivity and growth in capital stock, etc. The United States might find itself at a natural resource boundary, a problem that U.S. policy planners have not had to deal with in the past.

Growth of the tax base during the decade represents another problem of balance. As the U.S. economy grows will the tax base emerge which will support not only existing programs and their uncontrollable portion, but also new directions which federal, state and local governments might take during the decade? With the current emphasis on setting spending targets by balancing the full employment budget, planners must realize that this approach to fiscal planning presupposes spending the fiscal dividend in advance.

Distribution of this fiscal dividend among federal programs and to state and local governments via Grants-in-Aid has already begun. Grants-in-Aid to state and local governments for purposes of tax relief are anticipated to increase during the decade to levels double what they were in 1970. Expansion of existing federal programs in the area of social security are anticipated to require periodic adjustments in the tax rates and bases associated with the current wage tax out of which these programs are funded. Recent calculations with the Wharton Long Term Annual and Industry Forecasting Model imply that the necessary tax base will emerge which will permit funding of these programs which are currently expanding at rapid rates and at the same time balance budgets at full employment. However, as stated previously, policy planners must realize that no fiscal dividend under this approach to fiscal management will materialize. Thus the initial stages of planning of new programs must be carried out with extreme care. As full employment is reached, no surplus will materialize, leaving policy makers with a more difficult set of decisions to make, namely those associated with redistribution. These kinds of decisions have politically been the more painful type for U.S. policy planners.

One of the more important areas where solutions involve changing the composition of output include the emerging ecological issues. Proposed solutions suggest that investment as a ratio to GNP will have to rise to high levels. Recent estimates suggest that 2 to 5 percent of GNP per year will have to be devoted to solutions of these ecological problems during the current decade. This problem is complicated by the fact that the rate of return on investment in this area is of a social nature. The existing tax incentive programs and pricing system might have to be altered in order to bring about market solutions to these problems. Failure in this area would probably lead to more direct con-

trols and regulation. Targeting spending on full employment budgets without adequately considering the ecological issues and the resources needed to solve these problems, may leave policy planners little room to maneuver as full employment is reached. Again policy planners will face the more politically painful decisions of redistribution.

Targeting the economy at unemployment rates below 4.5 percentage points carries with it certain frictions and deficiencies which became apparent during the decade of the sixties. In the area of wage and price formation, the trade-off between the rate of inflation and the rate of unemployment led to certain dilemmas on the part of policy planners. The stickiness of wages and prices during periods of high unemployment resulted in implementation of wage and price controls. Recent simulations with the Wharton Long Term Annual and Industry Forecasting Model suggest that this trade-off mechanism and the associated lags are an integral part of the wage bargaining and price formation structure of the U.S. economy. Setting target rates of unemployment at less than 4.5 percentage points may bring a return to high rates of inflation. Development of new programs and agencies, short of wage-price controls, designed to break or reduce this trade-off relationship between the rate of increase in wages and target rates of unemployment, should be of great concern to policy planners.

The use of monetary policy to manage the economy during periods of high level growth has systematically led to disastrous affects in mortgage markets and subsequent new home construction. Given current administration stated policy of 25 million new housing starts by 1980, ways should be developed which would soften the effects of monetary management on particular sectors of the economy, sectors which are not primarily responsible for imbalances. Choosing target rates of unemployment which appear politically acceptable may in fact cause imbalances whose resulting effects may lead to reconsiderations concerning initial targets. In particular, operation of the U.S. economy at unemployment rates below 4.5 percent by the application of general fiscal and monetary policy may be an unacceptable and economically wasteful way to achieve full employment. Introduction of programs which deal directly with structural unemployment may represent a more feasible solution.

VI. Summary Observations on United States/U.S.S.R. Economic Comparisons

Despite all the ambiguities in comparisons of economic aggregates, and in the light of the best assumptions that can be made about the interpretation of the preliminary estimates, what can be said at the present time that is responsive to the policymakers' concerns expressed in the introduction?

1. There is little doubt that the Soviet production potential has moved appreciably closer to that of the United States over the years considered by the study. There are two qualifications to this finding, both of which somewhat mitigate the impression the GNP comparisons give of the favorable Soviet situation. First, during the last several years, U.S. GNP has provided an appreciable understatement of production potential. In 1970, for example, there was 6 percent unemployment, and output had fallen by one-half percent from the previous

year. Second, the preliminary SRI comparisons have been made in dollars only. If ruble comparisons were made, the ratio of U.S.S.R. to U.S. GNP would certainly be smaller, although a dynamic comparison would probably still reflect ratios with trends favorable to the U.S.S.R.

2. Regarding the validity of published Soviet data:

Soviet budget data on defense expenditures are an unreliable measure of annual resources devoted to military uses. This is not the case with U.S. NSE. Unlike the figures which the Russians release for defense expenditures, the data they publish for total science [15] are a fairly good reflection of the annual resources expended on R.D.T. & E. The major exclusion from the published data appears to be some, perhaps all, of the expenditures on prototype and other material-intensive R. & D. activities.

3. What the preliminary comparisons suggest, with all their data limitations and conceptual ambiguities, is that the Soviet leaders had a strong propensity to devote the new output derived from their expanding production potential to areas that are important for strategic power purposes, especially NSE and R.D.T. & E. This stands in sharp contrast to the recent situation in the United States.

4. Estimated on an annual basis for the period 1955 to 1970, the United States could have produced the Soviet mix of military forces and programs with less U.S. productive potential than was used to produce U.S. national security programs. That is, the Soviet national security program valued in dollars is estimated to have cost less than that of the United States in each year during the period studied. However, comparisons of dollar valuations of national security reflect the Soviet leaders' decision to increase their NSE faster than the United States during those sixteen years; the U.S.S.R./U.S. NSE ratio increased from 0.73 in 1955 to 0.90 in 1970, according to SRI estimates.

5. While the precise linkage between expenditures and military capability cannot be documented, this increase surely reflects the fact that they are catching up or have caught up with the United States in terms of military capability. Moreover, the calculated NSE ratios understate the rate at which the Soviets have closed on the United States and, if they continue to use their productive potential allocated to national security to emphasize procurement of durables, comparisons of near-term NSE estimates will understate the additions to military capability being realized by the U.S.S.R. Ruble estimates of U.S. NSE are needed before the comparisons can be placed in full perspective.

6. The R.D.T. & E. establishment of the U.S.S.R. employs substantially more individuals than does that of the United States. As a result, dollar valuations of total R.D.T. & E. expenditures reflect a significantly greater annual expenditure by the Soviets than by the United States. However, R.D.T. & E. figures are measures of inputs, representing the drain on production potential to service this objective. They are not measures of output, the payoff policymakers realize for this commitment of resources. It is, therefore, difficult to settle between two different interpretations of these findings about comparative R.D.T. & E. expenditures. First, that the larger Soviet dollar expenditure on R.D.T. & E. reflects the burden the U.S.S.R. is willing to bear

[15] Total science is defined as "science from all sources including R. & D. plant."

to achieve technology objectives vis-a-vis the United States. Second, that the larger dollar expenditure reflects significant inefficiencies in the Soviets' ability to generate equivalent R.D.T. & E. output. Moreover, it is recognized that these findings are not mutually exclusive.

7. The lack of R.D.T. & E. productivity measures prevents the calculation of net comparisons and interpretation of the meaning of U.S./U.S.S.R. R.D.T. & E. expenditure differences. It is not reasonable to expect, however, that the R.D.T. & E. sector for the Soviet Union would exhibit productivity relationships considerably different from those documented for industry which show the U.S.S.R. at about 40 percent that of the United States.

8. Definitive comparisons of military R.D.T. & E. expenditures are not possible at this time using published Soviet data; the breakdown of R.D.T. & E. between defense and nondefense is simply not documented. Comparisons can be made, however, by costing U.S.S.R. R.D.T. & E. programs and activities in dollars. Preliminary estimates of U.S.S.R. military R.D.T. & E. based on an SRI pilot study indicate that the Soviets might have expended in 1970 on a dollar basis up to $1 billion more than the United States. Again a ruble valuation of U.S. R.D.T. & E. programs and activities is needed to complete the comparative analysis.

9. Beyond the question of productivity in the use of R. & D. resources lies the question of the comparative ability of the two economies to translate newly available technology in a dynamic way to raise their productive potential. No comprehensive comparative study of this phenomenon is available but it can be documented that the Soviet Union has had more difficulty than the United States in absorbing new technology in such key areas as computer technology, chemicals, and agriculture.

10. Analysis of the current state of the two economies finds the Soviets in a period of transition in which their basic strategy for economic development and resource allocations has been revised. Because of institutional and structural problems, success of this strategy is uncertain. The United States conversely appears to be entering a period of more stable growth following the transition from a period of high inflation, high unemployment, and dislocations resulting from changing priorities. The near-term opportunities to pursue programs and initiatives represented by this comparative situation probably favor the United States over the U.S.S.R.

ECONOMIC BURDEN OF DEFENSE EXPENDITURES

By STANLEY H. COHN

CONTENTS

INTRODUCTION—CONCEPT OF OPPORTUNITY COST

Economic analysis measures the sacrifice of a particular use of resources in terms of the concept of opportunity cost. Given the limited availability of resources, both human and material, their utilization for one purpose is attained at the cost of sacrificing some other possible use. This postulate presumes full utilization of resources, i.e. full employment. The devotion of a significant share of an economy's national product to military purposes deprives the economy of the opportunity of using that output for higher levels of consumption and/or more rapid rates of growth in the form of higher levels of investment.

In this study two out of four possible approaches to the calculation of the Soviet military burden are developed: (1) Comparison of trends in the proportions of GNP devoted to the principal end-uses of national product—consumption, investment, and defense, and (2) Regression analysis of the possible trade-off's between selected defense expenditures and appropriate civilian analogues. The two other approaches: (3) Analysis of competing uses of resources, as revealed in an input-output matrix, and (4) Determination of possible competitive claims for scarce human inputs, would provide greater degrees of precision if they could be feasibly implemented. However, data deficiencies preclude their significant use at present.

Defense Expenditures Time Series

Basic Methodological Considerations

Soviet official statistics do not provide a comprehensive estimate of defense expenditures. According to an official source, the allocation in the state budget to the Ministry of Defense includes payments for delivery of armaments, supplies, equipment, fuel, food, and other material supplies. It also covers personnel pay, military construction, armament equipment repair, and operation of military hospitals, schools, and clubs.[1] Conspicuously omitted are outlays for research and development and for nuclear research and procurement. These major expenditure categories fall within the definition of defense expenditures used by the North Atlantic Treaty Organization. Investment in industrial enterprises producing military hardware is financed from the state budgetary category "Financing the National Economy" and from internal savings of state enterprises. This latter group of outlays are also excluded from NATO and U.S. definitions of defense expenditures.

No official indication is furnished as to the budgetary sources for research and developmental expenditures, but a substantial case can be made for their coverage from the budgetary allocation to "Science".[2] Not all of the budget financed scientific outlays are defense oriented. Offsetting this qualification is the financing of product testing (developmental outlays) out of funds provided by producing enterprises. The degree of this offset cannot be precisely determined. The computed alternative estimates of defense expenditures time series will assume no offset and complete offset, respectively.

Specialists in the field of Soviet public finance have suggested that other undesignated allocations in the state budget of a residual nature may also contain military expenditures.[3] However, as is the case with residual calculations, the unexplained remainder undoubtedly incorporates other types of expenditures, errors, and changes in definition, as well as the possibility of military outlays. The unsystematic trend of these residuals compels the potential user to specify ranges rather than single value estimates.[4] For these reasons none of the calculated budgetary residuals are included within the estimates of defense expenditures in this study.

Computed Alternative Time Series

Since the budgetary data from which the defense estimates are derived are in current prices, the key question in constructing an index of real defense outlays is that of deflation procedures. The determination of appropriate deflators, in turn, brings forth the issue of the internal composition of defense expenditures. Within the explicit defense budgetary category, it is possible to isolate the personnel component by independent estimates of average pay and allowances for a base year and personnel strength for all years. The portion of explicit defense expenditures remaining after deduction of the personnel component, designated as nonpersonnel, consists of two distinct cate-

[1] Vasilii Lavrov and K. N. Plotnikov (eds.). *Gosudarstvennyi Biudzhet SSSR* (State Budget of the U.S.S.R.), Moscow, Finansy, 1968, p. 341.
[2] Nancy Nimitz. *Soviet Expenditures on Scientific Research* (PM-3384-PR), Rand Corporation, Santa Monica, Jan. 1963, pp. 12–14.
[3] Abraham Becker, *Soviet Military Outlays Since 1955* (RM-3886-PR). Rand Corporation, Santa Monica, July 1964, pp. 13–41.
[4] *Ibid.*

gories—outlays for procurement of military equipment and armaments and outlays for operations and maintenance of existing forces. The latter grouping covers such expendable inputs as fuels, medical supplies, tires, electrical energy, and the like. The budgetary allocation to science, in whole or in part, is assumed to represent expenditures for research and development.

Two alternative time series have been computed. They make similar assumptions with regard to deflation of the personnel expenditure component, but differ on the non-personnel and research and development components. Each alternative series assumes that military pay scales have increased in the same proportion as civilian wages. They are deflated by the official general wage index. The cost of personnel subsistence is assumed to vary according to a weighted index of food and clothing prices.[5]

One series assumes that the non-personnel residual in the explicit defense allocation consists solely of military hardware procurement; the other series assumes that this residual is comprised of two parts of hardware procurement and one part of operations and maintenance outlays. The current value hardware procurement series is deflated by the official price index for machinery and the operations and maintenance outlays by the price index for petroleum products.

One time series assumes that all of the budgetary science allocation is used for defense purposes; the other alternative assumes that only half of the allocation is defense oriented.[6] In both instances the current value budget estimates are converted to constant prices by a composite deflator, three parts of which are deflated by the price index for machinery and one part by the index for wages in science.[7]

Trends in Defense Expenditures

The general trends and composition of Soviet defense expenditures since 1950 have been determined by both reactions to international political conditions and by technological advances in the military arts. The two decades following 1950 have been divided into periods which represent distinctive changes in defense policies (Table 1).

TABLE 1.—RATES OF CHANGE IN SELECTED DEFENSE EXPENDITURES FOR SELECTED PERIODS

[Annual average rates]

Expenditure category [1]	1950–52	1952–60	1960–63	1963–65	1965–69
Personnel	16.7	−4.8	0.8	0	5.3
Non personnel:					
"A" alternative	28.0	6.4	24.9	−3.5	11.3
"B" alternative	28.4	5.0	24.8	−4.7	6.8
Research and development	11.8	22.9	14.5	13.2	8.4
Total defense:					
"A" alternative	19.2	2.5	15.7	1.2	10.1
"B" alternative	21.6	.7	15.7	−.5	7.3

[1] The "A" alternative assumes that nonpersonnel consists solely of weapons procurement and that all of the science budgetary appropriation is defense oriented. The "B" alternative assumes that the nonpersonnel expenditures consist ⅔ of weapons procurement and ⅓ of operations and maintenance outlays and that only 50 percent of the science appropriation is used for defense purposes.

Source: App. A.

[5] Weights are based on the 1958 per man estimates of pay and subsistence (see Abraham Becker, *op. cit.*, p. 92).

[6] In 1969 approximately 53 percent of all state budgetary outlays for science were directed toward research and development. Since the author combines these outlays with net fixed investment, he implies that these outlays are directed toward non-military purposes (V. G. Lebedev, *Narodnokhoziaistvennyi Effektivnost' Razvitiia Tekniki*, Mysl', 1971, p. 73).

[7] The respective weights for the two deflators are based on the 1957 composition of the science allocations in the Union budget. (See Nancy Nimitz, *op. cit.*, p. 45).

There have been three distinct periods of acceleration of defense spending since 1950. The first period of rapid increase is that of the Korean War, the second the era of *sputnik* and the Berlin Wall, and the third the years of the late sixties of accelerated production and development of aerospace and nuclear weaponry. The long period of relaxation in the middle and late fifties is that of detente after the Korean War and the second corresponds to the era of the nuclear test ban treaty of the mid-sixties.

The composition of defense expenditures, with varying implications for claims on resources, has changed sharply over the period with the development and application of military technology. (Table 2) The Korean War splurge was conspicuously large in personnel outlays with the personnel strength reaching a postwar peak of approximately 6.4 million in 1952. After 1952, there was a continuous reduction in manpower through the early sixties with the most rapid demobilization occurring in the late fifties.[8] By contrast in the decade of the sixties personnel outlays accounted for only about a quarter of aggregate defense spending.[9] Even though defense expenditures as a whole showed little change between 1952 and 1960, the rapid decline in personnel costs was somewhat more than offset by large increase in weapons procurement and research and development outlays. In the past decade the Soviet defense production has become increasingly capital-intensive with hardware procurement and operations and maintenance accounting for over half of total, and outlays and research and development for a steadily rising share, now between a sixth and a quarter, depending on the defense index alternative selected. Of course, this drastic change in the composition of military spending has significant consequences in terms of opportunity costs.

TABLE 2.—COMPOSITION OF SOVIET DEFENSE EXPENDITURES

[Percentage of total outlays]

Category	1950	1952	1960	1963	1965	1969
"A" Alternative:						
Personnel	64.4	61.0	33.6	22.2	21.9	18.8
Nonpersonnel	30.1	34.3	46.1	58.1	53.2	57.1
Research and development	5.5	4.7	20.3	19.7	24.9	24.0
"B" Alternative:						
Personnel	65.3	61.2	38.4	25.5	26.2	24.8
Nonpersonnel	31.9	36.4	50.0	63.2	58.9	59.3
Research and development	2.8	2.4	11.6	11.3	14.9	15.9

Source: See appendix table A.

Defense and the Changing Composition of GNP

As a first approximation, the opportunity costs of Soviet defense expenditures will be determined by analyzing the changing composition of the uses of national product. By observing the proportions of GNP made available for the principal uses of product in those periods in which defense policy has shifted, some notion of the effect of the economy of changing defense commitments may be observed (Table 3). The proportions are expressed in terms of current prices in order to

[8] See Appendix Table A.

[9] Personnel costs are projected to account for over 35 percent of the U.S. defense budget, including retirement pay, in fiscal 1973 (Edward Fried, *Setting National Priorities: The 1973 Budget*, Brookings Institution, 1972, p. 78).

reflect price changes, as well as physical resource shifts. The defense row reflects the "B" alternative in which the non-personnel residual is assumed to include both weapons procurement and operations and maintenance outlays and in which only half of the science appropriation is assumed to be defense oriented.

TABLE 3.—EXPENDITURE COMPOSITION OF SOVIET GNP

[Percentage of total]

Use	1950	1952	1955	1960	1963	1965	1969
Private consumption	54.7	55.2	54.5	51.2	51.3	51.3	50.9
Public consumption	5.5	5.2	5.3	5.2	5.7	6.6	7.1
Capital investment	23.9	22.4	25.1	33.1	29.9	30.8	29.5
Defense	10.8	13.3	12.3	8.4	11.1	9.1	10.1
Administration	5.1	3.9	2.8	2.1	2.0	2.2	2.4
GNP	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Appendix table B-1.

If there is any clear resources trade-off it would appear to have been between defense and capital investment. Those reference years in which the defense share has risen are matched by declines in the capital investment proportion, though not by any systematic degrees of trade-off. The two uses combined have received fluctuating proportions at around 40 percent of production. During the sixties the investment share was some five points or so higher than in the fifties while the defense share had an average somewhat lower in the later decade. There is no perceptible competition between defense and consumption, either private or public. The private consumption share has fallen from an average of around 55 percent in the fifties to a stable proportion of about 51 percent in the sixties. The public consumption share has shifted upward somewhat, largely because of rapidly rising wage rates in education and health.

Another, and perhaps, more sensitive test is to compare rates of change of expenditure for the several end-use categories over the selected periods (Table 4). Again it would appear that investment is sensitive to changes in rates of defense spending, but that private consumption shows little evidence of competition for inputs used in military production. The table also indicates a close positive relationship between rates of increase in investment and in GNP, and an inverse one if defense growth rates are compared with those of GNP.

TABLE 4.—EXPENDITURE TRENDS FOR PRINCIPAL USES OF GNP

[Average annual rates]

Use	1950–52	1952–60	1960–63	1963–65	1965–69
Private consumption	7.0	6.7	3.5	4.8	6.2
Public consumption	5.1	5.1	6.8	6.2	5.3
Capital investment	12.5	12.7	4.8	8.6	6.8
Defense (A)	19.2	2.5	15.7	1.2	10.1
(B)	20.6	.7	15.7	−.5	7.3
Administration	−6.8	−2.7	2.5	3.5	6.1
GNP	5.2	6.3	4.0	7.0	4.9

Source: Appendix table B-1.

This type of comparison becomes more incisive if selected components of the three major uses of GNP are compared rather than the aggregates themselves. In this way it is possible to search for trade-offs between components of defense spending and their civilian analogues (Table 5). An obvious comparison is that of military hardware and producer and consumer durables. There exists considerable similarity of both human and material inputs into the production of both categories of output. The inverse pattern of growth fluctuations between procurement and producer durables is quite strong, except for the early sixties. If one excepts the very low base of consumer durables production in 1950, the same evident pattern of trade-off exists between weapons and consumer durables production. Similar comparisons could be made between other military and civilian production analogues. However, such an approach is impressionistic at best. A more rigorous technique is that of econometric analysis, to which the study now turns.

TABLE 5.—COMPARATIVE EXPENDITURE TRENDS FOR SELECTED COMPONENTS OF PRINCIPAL USES OF GNP

[Average annual rates of growth]

Use	1950–52	1952–60	1960–63	1963–65	1965–69
Private consumption: Consumer durables	18.3	17.3	7.4	9.3	8.9
Capital investment:					
Producer durables	3.1	13.9	11.8	10.3	6.5
Housing	16.2	14.9	−2.0	3.2	6.1
Other construction	14.6	11.4	3.2	9.0	6.0
Defense:					
Procurement (A)	28.0	6.4	39.7	−3.5	11.3
Procurement (B)	28.5	5.0	39.6	−4.7	6.8

Source: Appendix table C.

An Econometric Estimate of Defense Opportunity Cost

In order to ascertain if there has been any systematic resource trade-off between selected defense expenditures and analogue non-defense resource utilization, the technique of regression analysis will be employed. The underlying assumption of this analytical approach is that there is some linear relationship between trends in specified defense expenditures over time and trends in analogue non-defense resources claimants. Specifically, trends in the latter uses are assumed to be strongly influenced by (functions of) defense trends, in the context of this study in an inverse direction. The relationship between a defense expenditure and its non-defense analogue is expressed in the form of a linear estimating equation of the form $Y=a+bX$, in which Y is the dependent variable (non-defense expenditure); "a" is the value of expenditure for non-defense use when the defense expenditure is equal to zero (vertical intercept); "b" is the coefficient which indicates the multiple by which the non-defense expenditure changes,

given a unit (ruble) change in defense expenditure (slope); and X is the independent variable (defense expenditure).

The "b" coefficient or regression coefficient, is the degree of trade-off. Of equal importance is the extent to which the behavioral trends of non-defense variables can be explained statistically by trends in the independent defense expenditure variables. This relationship, technically known as the coefficient of determination, R^2, indicates the degree to which the non-defense expenditure trend is explained by the related defense expenditures trend.

Separate equations have been constructed for the five periods of shifts in defense expenditure policies for each pair of comparisons. The basic tests of the empirical results are the degree to which movements in the particular defense expenditure [10] variable explains trends in the non-defense variable and the variation in the regression coefficient, the ratio of change of the non-defense variable to a unit change in the defense expenditure variable. Ideally the correlation coefficient should be over .5 and as close to 1.0 as possible. The regression coefficient ("b" in the estimating equation) should be considerably smaller or negative in periods of rapid expansion of defense expenditures than in years of relative relaxation in defense spending.

The bilateral comparisons have been selected to match defense and non-defense analogues in varying degrees of dependence (Table 6). Before discussing possible trade-offs, the inverse trends of defense expenditures and GNP should be analyzed. As noted in Table 4, periods of rapid increase in military spending have coincided with decelerations in the growth rate for national product. Except for the 1952–60 period this observation is confirmed by regression analysis. The coefficient of determination is well over .8 and the regression coefficients show expected and sharp variations in the appropriate periods. However, it would be an oversimplification to conclude that fluctuations in defense spending provide the explanation for inversely related fluctuations in GNP growth rates. GNP trends are a function of a complex of factors, most readily summarized as a combination of factor inputs (labor, tangible capital, land, intangible capital, etc.) and the efficiency with which these inputs are used in the production process (productivity). The influence exerted by variations in defense expenditures on GNP is indirect, through effects on these underlying variables.

We can draw a tentative conclusion from the econometric analysis that Soviet defense expenditures have adversely affected Soviet economic growth. In order to understand more precisely just how the impact has been exerted we must investigate possible resource trade-offs between defense and non-defense resource use.

[10] The "B" alternative has been used for all defense and defense component variables.

TABLE 6.—RESULTS OF ESTIMATING EQUATIONS FOR TRADE-OFFS BETWEEN DEFENSE AND NONDEFENSE EXPENDITURES [1]

Independent variable—dependent variable and period	Regression coefficient	Coefficient of determination
DEFENSE		
GNP:		
1950–69	9.6	0.91
1950–52	2.3	.98
1952–60	16.0	.13
1960–63	2.8	.99
1963–65	−46.7	.97
1965–69	6.7	.82
DEFENSE		
Capital investment:		
1950–69	4.6	.91
1950–52	.9	.88
1952–60	8.2	.15
1960–63	1.3	.94
1963–65	−19.3	−.89
1965–69	3.7	.83
DEFENSE PROCUREMENT		
Producer durables:		
1950–69	1.7	.92
1950–52	.1	.97
1952–60	2.4	.59
1960–63	.7	.98
1963–65	−2.8	−.98
1965–69	1.4	.80
DEFENSE PROCUREMENT		
Consumer durables:		
1950–69	.4	.91
1950–52	.1	.70
DEFENSE		
1952–60	0.6	0.62
1960–63	.1	.99
1963–65	−.6	−.37
1965–69	.4	.76
Private consumption:		
1950–69	4.6	.89
1950–52	1.4	.70
1952–60	8.3	.11
1960–63	1.3	.94
1963–65	−15.0	−.72
1965–69	4.1	.84
DEFENSE		
Public consumption:		
1950–69	.50	.93
1950–52	.11	.88
1952–60	.06	.10
1960–63	.24	1.0
1963–65	−2.10	−.93
1965–69	.39	.91
DEFENSE		
Housing investment:		
1950–69	.53	.67
1950–52	.19	.55
1952–60	1.90	.11
1960–63	−.08	−.78
1963–65	−.08	−.85
1965–69	.39	.76

[1] All estimating equations statistically significant at 5 percent level, except for 1950–52 and 1963–65 comparisons in which only one degree of freedom imposes highly restrictive tests.

Source: App. D.

Comparing first resource trade-offs among the GNP aggregates, there appears to have been strong evidence of inverse movements between defense expenditures and those for both capital investment and private consumption in all periods other than 1952–60. The statistical explanation of the changes in the two major non-defense uses of national product as functions of the variation in defense spending is supported by the high coefficients of determination. Well over 80 percent of the trend in investment outlays is "explained" by defense spending trends and over 70 percent of the trend in private consumption outlays are similarly "explained". Furthermore, the regression coefficients for both categories are appreciably lower in periods of accelerating defense expenditures, as compared with periods of relaxation in the defense effort.

When the comparisons are between components of the GNP aggregates, even closer relationships result. In the trade-off between military weapons procurement and producer durables production, the coefficient of determination becomes significant in every period and nearly 1.0 in three of the periods. Again the regression coefficients show the fluctuations suggested by the general hypothesis. The functional relationship between defense procurement and consumer durables is weaker, though statistically significant in all but the 1963–65 period. Again, the regression coefficients are consistent with the general theme.

The trade-off relationship between defense and public consumption (health and education) and between defense and housing investment

are not as significant as the foregoing comparisons. The regression coefficients move in the "wrong" direction for public consumption in the first three periods and for housing in the 1963–65 period. Education has been a high priority resource claimant which has been exempted from the constraints placed on other non-defense users of resources. Housing trends are much more closely correlated with those for other types of construction whose input pattern it more nearly resembles than that of defense.

One general trend distinguishes the inter-period differences for all of the non-defense expenditure trends. The constraint imposed by rising defense expenditures appears to have been less pervasive in the 1965–69 period than in the earlier ones of rapid increases in military spending. This distinction implies that the larger and more highly developed Soviet economy of the late nineteen sixties could more readily sustain a guns and butter policy at less sacrifice than in earlier years. However, the resources foregone were still considerable.

If, as computed in the foregoing estimating equations, the clearest resource trade-off has been between defense weapons procurement and producer durables, the implications for economic growth are twofold. Fluctuations in production of producer durables lead to fluctuations in the rate of increase in capital stock, one of the primary ingredients in the growth process. Perhaps even more significantly, such inverse fluctuations also have a significant qualitative impact on growth in terms of the quality of capital assets and their productivity. It is through investment in producer durables that new technology becomes embodied in capital stock, and thereby, adds to the productivity of such fixed assets. By constraining the production of productive equipment rising demands for weapons limit the application of the fruits of technological research into the production process.

If, as has been claimed by an official spokesman, that the nation's best scientific and engineering talent has been assigned to advanced weapons development,[11] then technological advancement in the civilian sectors has suffered qualitatively. In an era when the leadership is desperately striving to find in technology the solution to lagging growth, such a policy is self-defeating.

The impact of defense spending upon consumption is somewhat weaker and more difficult to discern. It is clearest in the case of consumer durables where the technological constraints are analogous to those for producer durables. In fact, some consumer durables are produced as by-products in defense plants. Little systematic relationship has been shown between defense and housing construction trends. The other main goods components of consumption, food and apparel, are heavily dependent upon agricultural performance. Therefore, the causative influence of defense policy is likely to be tenuous.

Alternative Regression Formulas

Although the regression results disclose the prevalance of significant trade-offs between defense and non-defense uses of resources as defense policies shifted over two decades, other regression formulas might provide clearer and more reliable conclusions than the linear equations used. Since the focus of the interest is upon changes in resource alloca-

[11] Statement attributed to Academician N. N. Semenov, a vice-president of the U.S.S.R. Academy of Sciences. Quoted from Organization for Economic Cooperation and Development, *Science Policy in the U.S.S.R.*, 1969, p. 435.

tion in both direction and degree over short time periods, a formula which highlights such changes, one using logarithmic values, should be applied to compute trends. In addition, in the relationship between trends in defense expenditures and in GNP, some lag should be introduced. The use of logarithmic functions would not only have the advantage of distinctly measuring changes in trend, but also would minimize the possibility of accepting false hypotheses (type II error) over short time periods.

Subsequent revisions of the present study will incorporate these methodological revisions, as well as attempt to use the two alternative approaches discussed in the next two sections of the contribution.

Analysis of Input-Output Structure

The Soviet statistical agency has published comprehensive input-output tables for both 1959 and 1966. The raw information presented in official publications has been further refined and analyzed in the research of Professor Vladimir Treml and his associates.[12] The Soviet table, as refined by Treml, contains a 76 sector matrix for intermediate transactions and final demand columns for private consumption, public consumption, and other uses. Unfortunately for our purposes, the other uses column combines investment, defense, and exports into a single aggregate.

A comparable input-output matrix for the U.S. economy for 1963, compiled by the Department of Commerce, has a somewhat larger intermediate product matrix with a separate final demand column for defense.[13] If there were no other serious data deficiencies, it might be possible to improvise the pattern of Soviet defense resource drains by fitting the U.S. pattern of defense expenditures into the Soviet matrix, with some changes determined by knowledge of the difference between Soviet and U.S. military inventories and production.

However, even this improvisation is not worthwhile because of classification ambiguities in the Soviet matrix. The official classification list lists no sectors which specifically contain military products. The list of sectors, as compiled by Treml either completely exclude military production or effectively conceal it within machinery sectors of highly aggregate composition with imprecise titles. For example, the aircraft industry may be blanketed into the "transportation machinery and equipment" sector, the electronics industry into the "other machine building" sector, and tank production in "agricultural machine building".

If the information provided in U.S. matrixes were available in the official Soviet input-output matrix, then highly specific data would be available to measure the economic impact of defense programs upon the existing distribution of resources. Until such time as such information is provided, less precise approaches must be used.

Inputs

Analysis of Sectoral Distribution of High Quality Human

Perhaps the major deficiency of the conventional input-output matrix is its assumption of manpower input homogeneity. Generally

[12] Vladimir Treml, Dimitri Gallik, Barry Kostinsky, and Kurt Krueger, *The Structure of the Soviet Economy*, Praeger, 1972.

[13] Office of Business Economics, U.S. Department of Commerce, *Input-Output Structure of the U.S. Economy: 1963*, Vol. I, 1969, pp. 186–190.

labor input is included as a single row in the value-added quadrant of the table. However, particularly in an economy operating at full employment, bottlenecks for certain categories of skilled labor may be more crucial than those for particular material inputs. Therefore, the conventional input-output matrix should be supplemented by a manpower matrix which depicts the distribution of pertinent manpower skills by employing sectors.

A start in this direction has been made in United States social accounts, both in construction of a general distribution of occupational skills by industrial sectors [14] and in special studies on the distribution of particular skills in defense-oriented sectors.[15] No differentiated manpower allocation has been published in the Soviet Union. The published input-output table shows labor input in terms of total man-years by using sectors.

A vague notion of the possible skilled manpower requirements of defense production is conveyed by the changing composition of graduates of higher educational institutions and technical institutes, published in the annual economic handbook. Rates of increase have been most striking for engineers trained in electrical engineering, electronics, and communications engineering. Modern weaponry production uses such skills heavily but so does production of industrial control equipment and of consumer durables. No doubt the composition of university and technical institute graduates has been strongly influenced by defense production requirements, but the degree cannot be ascertained from published information. This potentially lucrative approach cannot be utilized until official Soviet statistics provide some matrix of occupational distribution by economic sectors.

Appendix A

Derivation of Defense Expenditures Time Series

In order to determine the impact of defense expenditures upon the economy some notion of the trend in the real drain of resources is a prerequisite. For this purpose it is necessary to derive deflators for current value estimates. The procedure follows this sequence: (1) estimate of personnel expenditures in constant prices, (2) estimate of personnel expenditures in current prices and of non-personnel expenditures in current prices, (3) deflation of non-personnel expenditures time series, (4) estimate of research and development expenditures in current prices, (5) deflation of current value science expenditures, and (6) summation of the three appropriate component time series.

In one respect there is an apparent inconsistency in the procedure employed. The summation which reflects total defense expenditures at constant prices includes non-personnel and science outlays in such expression, but personnel outlays are expressed in current prices. The reason for this apparent aberration is to reflect changes in the quality of military personnel services over the years. Presumably the official price indexes used to deflate the other two main expenditure components do reflect quality changes by frequent linked changes in the price base. However, the constant price personnel time series does not conform to this requirement, as it merely values per man outlays in terms of 1958 rates. Thus, the attempt to reflect changes in skill composition by periodic changes in weights is missing. As a substitute for this usual procedure, an index deflated by changes in general wage rates has been adopted. Otherwise real personnel cost would be subject to increasing distortion as one moved farther from the base price year, 1958.

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[14] Bureau of Labor Statistics, *Tomorrow's Manpower Needs*, Vol. IV, (Bulletin 1606), 1969.

[15] Max Rutznick, "Skills and Location of Defense Related Workers," *Monthly Labor Review*, Feb. 1970, pp. 12 and 13.

APPENDIX TABLE A.—DERIVATION OF DEFENSE EXPENDITURES TIMES SERIES
[Billion of rubles]

Year	(1) Explicit defense budget	(2) Personnel (millions)	(3) Pay (1955 prices)	(4) Subsistence (1955 prices)	(5) Pay (current prices)	(6) Subsistence (current prices)	(7) Personnel costs (current prices)
1950	8.3	4.6	3.2	1.7	2.9	1.8	4.7
1951	9.3	5.4	3.7	2.0	3.4	2.0	5.4
1952	10.9	6.4	4.4	2.4	4.1	2.3	6.4
1953	10.8	5.8	4.0	2.1	3.8	2.0	5.8
1954	10.0	5.8	4.0	2.1	3.9	2.0	5.9
1955	10.7	5.2	3.6	1.9	3.6	1.9	5.5
1956	9.7	4.8	3.3	1.8	3.4	1.8	5.2
1957	9.1	4.2	2.9	1.6	3.1	1.7	4.8
1958	9.4	3.8	2.6	1.4	2.8	1.5	4.3
1959	9.4	3.6	2.5	1.3	2.8	1.5	4.3
1960	9.3	3.6	2.5	1.3	2.8	1.5	4.3
1961	11.6	3.8	2.6	1.4	3.0	1.7	4.7
1962	12.7	3.5	2.4	1.3	2.9	1.6	4.5
1963	13.9	3.3	2.3	1.2	2.8	1.6	4.4
1964	13.3	3.3	2.3	1.2	2.9	1.6	4.5
1965	12.8	3.2	2.2	1.2	2.9	1.5	4.4
1966	13.4	3.2	2.2	1.2	3.0	1.6	4.6
1967	14.5	3.2	2.2	1.2	3.2	1.6	4.8
1968	16.7	3.2	2.2	1.2	3.5	1.6	5.1
1969	17.7	3.2	2.3	1.2	3.8	1.6	5.4

Year	(8) Nonpersonnel expenditures, Current prices	(9) Nonpersonnel expenditures, A alternative (1955 prices)	(10) Nonpersonnel expenditures, B alternative (1955 prices)	(11) Science, Current prices	(12) Science, A alternative (1955 prices)	(13) Science, B alternative (1955 prices)	(14) Total defense, A alternative (1955 prices)	(15) Total defense, B alternative (1955 prices)
1950	3.6	2.5	2.5	0.5	0.4	0.2	7.6	7.4
1951	3.9	2.7	2.8	.5	.5	.2	8.5	8.4
1952	4.5	3.9	4.1	.6	.5	.3	10.8	10.9
1953	5.0	4.3	4.5	.6	.5	.3	10.6	10.6
1954	4.1	3.6	3.7	.7	.6	.3	10.1	9.9
1955	5.2	5.2	5.2	.8	.8	.4	11.5	11.1
1965	4.5	4.6	4.6	.9	.8	.4	10.6	10.2
1957	4.3	4.5	4.5	1.3	1.3	.7	10.6	10.0
1958	5.1	6.1	5.8	1.7	1.9	1.0	12.3	11.1
1959	5.1	6.2	5.9	2.0	2.2	1.1	12.7	11.3
1960	5.0	6.3	5.9	2.3	2.6	1.3	13.2	11.5
1961	6.9	8.6	8.1	2.7	3.1	1.6	16.4	14.4
1962	8.2	10.5	10.0	3.0	3.4	1.7	18.4	16.2
1963	9.5	12.1	11.4	3.4	3.9	2.0	20.4	17.8
1964	8.8	11.6	10.9	3.9	4.5	2.3	20.6	17.8
1965	8.4	11.5	10.7	4.3	5.0	2.5	20.9	17.6
1966	8.8	12.5	11.5	4.6	5.4	2.7	22.5	18.8
1967	9.7	13.9	11.0	5.1	6.0	3.0	24.7	18.8
1968	11.6	16.8	13.2	5.5	6.3	3.2	28.2	20.5
1969	12.3	18.4	14.4	5.9	6.9	3.5	30.7	23.3

SOURCE

Col. 1. U.S.S.R., Biudzhetnoe Upravlenie, Gosudarstvennyi Biudzhet S.S.S.R. i Biudzhety Soiuznykh Respublik, 1966, p. 53. Tsentral'noe Statisticheskoe Upravlenie (Ts.S.U.), Narodnoe Khoziaistvo S.S.S.R. v 1970 Godu, p. 769.

Col. 2. 1950–59: Ritchie Reed, Estimates and Projections of the Labor Force and Civilian Employment in the U.S.S.R.: 1950–75, Foreign Demographic Division, Bureau of the Census, 1967, p. 15.

1960–69: International Institute for Strategic Studies, The Military Balance, 1971–1972, p. 63.

Col. 3 and 4. Abraham Becker, Soviet National Income, 1958–64, University of California Press, 1969, p. 307. Becker's 1958 prices and wage rates converted to 1955 basis by references cited for col. 5 and 6.

Col. 5. Ts.S.U., Trud v S.S.S.R., 1968, p. 137, General Wage Index.

Col. 6. Ts.S.U., Narodnoe Khoziaistvo S.S.S.R. for following years: 1962, p. 144; 1967, p. 226; 1969, p. 188. Deflated by the index for consumer goods.

Col. 7. Col. 5 plus col. 6.

Col. 8. Col. 1 plus col. 7.

Col. 9. Assumed composed 100 percent of procurement expenditures. Deflate by heavy industry price index in Ts.S.U., Narodnoe Khoziaistvo S.S.S.R. for following years: 1962, p. 144 and 1969, p. 188.

Col. 10. Assumed composed ⅔ of procurement outlays and ½ of operations and maintenance expenditures. Deflate by proportionately weighted heavy industry and petroleum products price indexes. Same sources as col. 9.

Col. 11. Same sources as col. 1.

Col. 12. Assume that the 1957 cost breakdown of four to one between equipment and personnel expenditures is applicable for other years (Nancy Nimitz, Soviet Expenditures for Scientific Research (PM-3384-PR), Rand Corporation, 1963, p. 45.) Equipment outlays are deflated by the machinery price index (same source as column 6) and personnel costs by the index of wages in science (Ts.S.U., Trud v S.S.S.R., pp. 137, 139 and Ts.S.U., Narodnoe Khoziaistvo S.S.S.R. v 1969 Godu, p. 540).

Col. 13. 50 percent of col. 12 with upward rounding.

Col. 14. Col. 8 plus col. 9 plus col. 12.

Col. 15. Col. 8 plus col. 10 plus col. 13.

APPENDIX B

TRENDS IN UTILIZATION OF SOVIET GNP

The calculation of the distribution of Soviet GNP in selected years proceeds by the following steps: (1) Estimation of a base year distribution of GNP, (2) calculation of distribution of GNP in selected years in prices of the base year through use of appropriate quantity indexes, (3) computation of deflators for each and use, and (4) conversion of constant into current price values through application of the deflators. The first two steps have been combined in the expression of table B–1. (The source references for each end use refer to indexes rather than to ruble values.)

APPENDIX TABLE B–1.—TRENDS IN SOVIET GNP BY END USE IN CONSTANT PRICES

[Percentages of total]

Use	1950	1952	1955 [1]	1960	1963	1965	1969
A defense alternative:							
Private consumption [2]	55.1	53.4	54.5	51.7	48.4	47.5	46.4
Public consumption [2]	6.2	5.8	5.3	4.9	5.1	5.1	4.8
Capital investment [3]	21.2	22.1	25.1	31.7	31.9	33.9	34.3
Defense [4]	11.6	14.3	12.3	9.7	12.8	11.7	12.8
Adminstration [5]	5.9	4.4	2.8	2.0	1.8	1.8	1.7
Total GNP	100.0	100.0	100.0	100.0	100.0	100.0	100.0
B defense alternative:							
Private consumption	55.2	53.6	54.5	52.3	49.1	48.5	47.8
Public consumption	6.2	5.8	5.3	5.0	5.2	5.2	5.0
Capital investment	21.2	22.2	25.1	32.1	32.4	34.6	35.4
Defense	11.4	14.0	12.3	8.6	11.4	9.9	10.0
Administration	6.0	4.4	2.8	2.0	1.9	1.8	1.8
Total GNP	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Morris Bornstein and Associates, "Soviet National Accounts for 1955," Center for Russian Studies, University of Michigan, 1961, pp. 71–76. The residual of "other" expenditures has been omitted. It consists largely of inventories for which annual published data is lacking prior to 1958.

[2] David Bronson and Barbara Severin, "Recent Trends in Consumption and Disposable Money Income in the U.S.S.R." in Joint Economic Committee, "New Directions in the Soviet Economy," 1966, p. 521. Same authors, "Consumer Welfare" in J.E.C., "Economic Performance and Military Burden in the Soviet Union," 1970, p. 97. Public consumption is equivalent to education and health services in their classification, private consumption includes all other consumption categories.

[3] Ts.S.U., Kapital'noe Stroitel'stvo v. S.S.S.R., p. 36, 43, 152, 188. Ts.S.U., "Narodnoe Khoziaistvo S.S.S.R. v. 1969 Godu," pp. 501–502.

[4] App. table A–1.

[5] Moved by employment in administration in state, economic, cooperative, and social organizations, Ts.S.U., "Trud v. S.S.S.R," pp. 28–29. Ts.S.U., "Narodnoe Khoziaistvo S.S.S.R. v. 1969 Godu," p. 571.

Since price indexes are available only for inputs into the end uses of GNP or for their components of expenditure, rather than for the end uses themselves, the computed indexes are based upon weighted price indexes for indicator inputs or outputs comprising each end use. For consumption the approach is to determine the composition of expenditures, then determine which combination of price indexes should be used for each type of expenditure. The division between private and publicly financed expenditures has been estimated in Table B–1. The composition of private expenditures for 1959 has been estimated by Becker in *Soviet National Income and Product, 1958–62*, Part I, p. 9. The weight for income in kind is based on my estimate in *Derivation of 1959 Value-Added Weights For Originating Sectors of Soviet GNP*, p. 23. The proportionate weights are, respectively: state retail store sales—60; collective farm market sales—4; private consumer service—9 and income in kind—13.

The price index for goods sold in state retail outlets is the official index obtained from the following editions of *Narodnoe Khoziaistvo SSSR:* 1961, p. 654; 1954, p. 647; 1965, p. 653; 1969, p. 625. The index for collective farm market sales is obtained from the following editions of the handbook; 1958, p. 789; 1960, p. 737; 1962, p. 540; 1965, p. 665; and 1967, p. 739. The price index for income in kind is a weighted average reflecting proportionate sizes of state retail and collective farm market sales in private consumption as a whole.

The price index for private services and for public consumption are weighted 3 to 1 by the price indexes for health and education wages and for all industrial goods. This breakdown is obtained from Akademiia Nauk SSSR, *Mezhotraslevoi*

Balans Proizvodstva i Raseredeleniie Produktsii Ekonomicheskogo Raiona, 1964, p. 199. The wage index is obtained from the *Trud* reference cited in Table B–1 and the 1969 economic handbook; the price index from various editions of the handbook.

For investment, for the two basic components of fixed investment, construction and equipment, are weighted by their average values for the period 1956–60 with respective weights of 7 for construction and 3 for equipment. The construction index is the official one found in the 1969 handbook, p. 523. The price index for equipment is the official price index for machinery, found on p. 188 of the same handbook.

The defense price increase is obtained in the "A" alternative by dividing the sum of column 1 and column 12 by column 14 and in the "B" alternative the sum of column 1 and column 12 by column 15 of Appendix Table A.

The deflator for administration is weighted 2 to 1 by personnel and material expenditures (G. S. Mergelov, *Planirovanie i Finansirovanie Raskhodov na Upravelenie*, 1962, p. 11). The deflator for personnel is the official wage index for administrative personnel found in *Trud* and the 1969 handbook; the deflator for materials is the official wholesale enterprise price index for all industrial output noted above.

The deflators for the expenditure components of GNP are shown in Table B–2.

APPENDIX TABLE B–2.—DEFLATORS FOR EXPENDITURE COMPONENTS OF SOVIET GNP

[1955=100]

Use	1950	1952	1955	1960	1963	1965	1969
Private consumption	112.9	112.4	100	102.1	104.4	107.9	113.5
Public consumption	101.5	98.9	100	104.0	109.0	129.4	153.9
Capital investment	128.6	109.9	100	102.8	92.5	90.9	89.2
Defense (A)	126.1	110.2	100	93.8	89.4	87.1	84.3
Defense (B)	124.3	111.1	100	97.3	92.8	91.7	97.9
Administration	97.9	96.2	100	105.3	113.2	122.0	148.7

The constant 1955 ruble proportions in Table B–1 are converted to current rubles by multiplying by the appropriate deflators in Table B–2.

APPENDIX TABLE B–3.—SHARES OF SOVIET GNP BY END USE IN CURRENT VALUES

[Percentage of total]

Use	1950	1952	1955	1960	1963	1965	1969
"A" defense alternative:							
Private consumption	53.6	54.5	54.5	50.8	51.0	50.7	50.7
Public consumption	5.4	5.2	5.3	5.1	5.7	6.5	7.1
Capital investment	23.4	22.1	25.1	32.8	29.8	30.5	29.4
Defense	12.6	14.4	12.3	9.2	11.5	10.1	10.4
Administration	5.0	3.8	2.8	2.1	2.0	2.2	2.4
GNP	100.0	100.0	100.0	100.0	100.0	100.0	100.0
"B" defense alternative:							
Private consumption	54.7	55.2	54.5	51.2	51.3	51.3	50.9
Public consumption	5.5	5.2	5.3	5.2	5.7	6.6	7.1
Capital investment	23.9	22.4	25.1	33.1	29.9	30.8	29.5
Defense	10.8	13.3	12.3	8.4	11.1	9.1	10.1
Administration	5.1	3.9	2.8	2.1	2.0	2.2	2.4
GNP	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Appendix C

APPENDIX TABLE C.—DERIVATION OF TIME SERIES FOR SELECTED NONDEFENSE END USES OF GROSS NATIONAL PRODUCT

[In billions of 1955 rubles]

Year	Capital investment	Producer durables	Construction [1]	Housing [1]	Other construction [1]	Consumption	Public consumption	Personal consumption	Consumer variables	Administration
1950	10.9	3.2	7.1	2.0	5.1	38.9	3.9	35.0	0.5	3.8
1951	12.4	3.2	(8.3)	(2.5)	(5.8)	42.3	4.1	38.2	.6	----------
1952	13.8	3.4	9.4	2.7	6.7	44.4	4.3	40.1	.7	3.3
1953	14.6	3.6	(10.2)	(3.0)	(7.2)	47.0	4.5	42.5	.9	----------
1954	17.3	4.4	(12.0)	(3.6)	(8.4)	50.4	4.8	45.6	1.2	----------
1955	19.6	5.4	12.7	3.8	8.9	56.6	5.0	51.6	1.4	2.8
1956	22.5	6.8	15.0	4.5	10.5	60.3	5.3	55.0	1.5	----------
1957	25.4	7.6	16.1	6.2	9.9	63.9	5.6	58.3	1.7	----------
1958	29.4	8.4	19.3	7.5	11.8	67.1	5.9	61.2	1.9	----------
1959	33.3	9.2	22.3	8.3	14.0	70.5	6.2	64.3	2.2	----------
1960	35.9	9.6	24.1	8.2	15.9	73.9	6.4	67.5	2.5	2.6
1961	37.5	10.8	24.3	7.8	16.5	76.9	7.0	69.9	2.7	----------
1962	39.3	12.1	24.7	7.7	17.0	80.9	7.4	73.5	2.9	----------
1963	41.3	13.4	25.2	7.7	17.5	82.5	7.8	74.7	3.1	2.8
1964	45.0	15.2	26.7	7.4	19.3	85.4	8.3	77.1	3.2	----------
1965	48.7	16.3	29.0	8.2	20.8	90.8	8.8	82.0	3.7	3.0
1966	52.4	17.2	31.0	9.0	22.0	96.5	9.3	87.2	4.1	----------
1967	56.7	18.6	33.6	9.6	24.0	103.9	9.7	94.2	4.5	----------
1968	61.4	20.3	36.0	10.1	25.9	109.8	10.4	99.4	4.9	----------
1969	63.4	20.9	36.7	10.4	26.3	115.1	10.8	104.3	5.2	3.8

[1] Parentheses denotes interpolation.

SOURCE

Base year estimate.—The base year estimates in 1955 for the ruble values of the expenditure components of GNP have been derived from the study by Morris Bornstein and Associates, noted in the sources to table B–1. 1955 base year estimates differ from those shown in table B–1 by measuring in current ruble values rather than proportions of GNP. The capital investment total is lower in table C through omission of the "other capital work and expenditures" category. It is therefore, summation of the construction and producer durables columns.

Time series estimates.—Cols. 1 through 4. Kapital'noe Stroitel'stvo v SSSR, 1961, pp. 36, 43, 152, 188. Ts.S.U., Narodnoe Khoziaistvo SSSR v 1969 Godu, pp. 501, 502.

Col. 5 Col. 3 less col. 4.

Cols. 6 through 9. David Bronson and Barbara Severin, "Recent Trends in Consumption and Disposable Money Income in the USSR" in Joint Economic Committee, "New Directions in the Soviet Economy," 1966, p. 521. Same authors, "Consumer Welfare" in Joint Economic Committee, "Economic Performance and the Military Burden in the Soviet Union," 1970, p. 97.

Col. 10. Moved by employment in administration in state, economic, cooperative, and social organizations. Ts.S.U. Trud v SSSR, pp. 28–29. Ts.S.U. Narodnoe Khoziaistvo SSSR v 1969 Godu, p. 571.

Appendix D

Basic Estimating Equations

In the following equations the defense and defense procurement (non-personnel) variables refer to the "B" alternative described in the text and in Appendix A.

X—DEFENSE Y—GROSS NATIONAL PRODUCT

Period	Estimating equation	R^1
1950 to 1952	Y=56,206+2.312X	0.98
1952 to 1960	Y=−64,130+16.049X	.13
1960 to 1963	Y=100,600+2.777X	.99
1963 to 1965	Y=951,700−46.619X	.97
1965 to 1969	Y=62,250+6.724X	.83
1950 to 1969	Y=2,842+9.589X	.91

X—DEFENSE Y—CAPITAL INVESTMENT

Period	Estimating equation	R [1]
1950 to 1952	Y=7,075+0.923X	.88
1952 to 1960	Y=−58,020+8.157X	.15
1960 to 1963	Y=26,840+1.265X	.94
1963 to 1965	Y=382,400−19.333X	.89
1965 to 1969	Y=−685+3.664X	.83
1950 to 1969	Y=−20,920+4.594X	.91

X—DEFENSE PROCUREMENT Y—PRODUCER DURABLES

Period	Estimating equation	R [1]
1950 to 1952	Y=2,863+0.141X	.97
1952 to 1960	Y=−4.853+2.402X	.59
1960 to 1963	Y=5.458+0.716X	.97
1963 to 1965	Y=44,330−2.842X	.98
1965 to 1969	Y=23+0.404X	.80
1950 to 1969	Y=−1,516+1.702X	.92

X—DEFENSE PROCUREMENT Y—CONSUMER DURABLES

Period	Estimating equation	R [1]
1950 to 1952	Y=276+0.113X	.97
1952 to 1960	Y=−1,283+0.601X	.61
1960 to 1963	Y=1,851+0.113X	.99
1963 to 1965	Y=8,696−0.519X	.37
1965 to 1969	Y=23+0.404X	.70
1950 to 1969	Y=−446.5+0.415X	.91

X—DEFENSE Y—PRIVATE CONSUMPTION

Period	Estimating equation	R [1]
1950 to 1952	Y= 25,610+1.412X	.70
1952 to 1960	Y= −33,000+8.27X	.11
1960 to 1963	Y= 53,190+1.256X	.94
1963 to 1965	Y 333,700−15,048X	.72
1965 to 1969	Y= 15,210+1.417X	.84
1950 to 1969	Y= 4,221+4.617X	.89

X—DEFENSE Y—PUBLIC CONSUMPTION

Period	Estimating equation	R [1]
1950 to 1952	Y= 3,109+0.115X	.88
1952 to 1960	Y= −1,257+0.627X	.11
1960 to 1963	Y= 3,795+0.231X	1.00
1963 to 1965	Y= 44,730−2.143X	.93
1965 to 1969	Y= 2,553+0.385X	.91
1950 to 1969	Y= 88+0.499X	.94

X—DEFENSE Y—HOUSING INVESTMENT

Period	Estimating equation	R [1]
1950 to 1952	Y= 3,777+0.189X	.55
1952 to 1960	Y= −14,820+1.915X	.11
1960 to 1963	Y= 9,088−0.085X	.78
1963 to 1965	Y= 21,530−0.809X	.58
1965 to 1969	Y= 2,060+0.392X	.76
1950 to 1969	Y= −661+0.532X	.67

[1] 5 percent level of significance.

THE OPPORTUNITY COSTS OF SOVIET MILITARY CONSCRIPTS

By EARL R. BRUBAKER

CONTENTS

DISPARITY BETWEEN MONETARY AND REAL SOVIET MILITARY MANPOWER COSTS

Virtually from its inception the Soviet government has relied on systems of military conscription for a flow of recruits into its armed services. As the continuing debate over the military draft in the United States has made quite clear, such a system may be expected to entail substantial economic effects. First, use of the draft results in losses of real output because of associated distortions in the allocation of labor, and second, it imposes an especially heavy burden of defense expenditure on a relatively small segment of the population.

Conscription also tends to result in understatement of the burden of military manpower in the national income and product accounts. Accounts that show only the budgetary outlays for remuneration of personnel in the armed services (including income in kind) may understate considerably the military costs measured by production foregone in the civilian economy. Furthermore, trends in military expenditure may be distorted during a period of conversion from a system of conscription to a volunteer armed service because an illusion of rapidly rising military manpower costs may be created. As remuneration of servicemen rises, budgetary outlays grow rapidly. In the United States, for example, between fiscal 1968 and 1973, while military and civilian personnel employed by the Department of Defense declined by about 1.5 million, outlays for personnel increased $10 billion. In particular, average military pay approximately doubled. The true personnel costs were not rising nearly so fast, however, since the increase represented in large part merely the uncovering of cost previously hidden by conscription.

During this period, since conscription remained fully effective in the U.S.S.R., an important additional element in the incomparability of the scope of Soviet and American defense expenditure officially reported was creeping in. Analysis of the economic implications of the

Soviet system of conscription will be of use, therefore, not only for understanding manpower and tax policy options available to the Soviet leadership, it also will be useful to any policy maker who needs to base his decisions in part on an accurate assessment of the level and structure of Soviet military expenditure. For example, the authors of the Brookings Institution report, *Setting National Priorities: The 1973 Budget* (pp. 82 ff.) present a cogent discussion of the way in which the Soviet defense budget and its components impinge upon American decisions regarding the appropriate level of defense expenditure.[1]

Just how important quantitatively is the understatement of Soviet expenditure on military manpower because of failure to value the services of recruits at the full worth of the civilian product foregone? In view of the notable Soviet secrecy regarding military matters, it turns out that there is available a surprising amount of evidence that makes possible a useful first approximation to an answer to this question.

According to computations presented in Table 1 and explained in more detail below, during much of the postwar period the tax on Soviet conscripts has amounted to something on the order of five and one-half to seven percent of the explicit defense budget. Since the early 1950's it has grown as little as two percent of previously estimated expenditures for military manpower to perhaps more than thirty percent by the early 1970's. In other words, the costs of Soviet military manpower have been rising very much faster than the official accounts show, since an accurate valuation would include the increasing hidden tax on conscripts. The prospects, unless the Soviet system of military conscription and compensation change drastically, are for even more pronounced distortions in the immediate future. Civilian opportunity costs of Soviet draftees will continue to rise with the basic trend in growth of productivity and earnings in the civilian sector. Unless compensation of conscripts grows commensurately, the average implicit tax will continue to rise, and the associated distortion in perception of the level and structure of Soviet military expenditure will become even more acute. The analysis implies also that with the implicit tax per man having risen to quite substantial levels, the total has become much more sensitive to the number of conscripts serving. In any future partial mobilization of conventional forces, standard national accounting practices could lead to a significant understatement of the corresponding expansion of costs of the military and especially of its manpower.

From the viewpoint of Soviet allocational policy it seems important to emphasize, especially in periods like 1972–73 when failures to attain major national output and productivity goals are of great concern, that the actual cost of a military recruit to the Soviet economy in the mid-1970's is likely on average to be two or three times that indicated by the official budgetary outlays. Conversely, the potential gain to the civilian economy from a reduction in military manpower is far larger than the official accounts show.

Even in the United States with its highly developed appreciation for the subtleties of economic calculation military manpower decisions have tended to be influenced by apparent rather than real costs. In the U.S.S.R., where cost calculations generally have played a lesser role,

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[1] Charles L. Schultze, Edward R. Fried, Alice M. Rivlin, and Nancy H. Teeters, *Setting National Priorities: The 1973 Budget*, The Brookings Institution, 1972.

such tendencies may well be even more pronounced. On the other hand, of course, decisions regarding systems of military manpower recruitment often are heavily influenced by factors beyond easily quantifiable economic magnitudes. It may also be true, however, that the dramatic recent reformulation of the American system of recruitment may stimulate the Soviet leadership to a greater appreciation for the opportunity costs of their own armed forces. In the remainder of this paper we present evidence and analysis substantiating that the conclusions about the size of the implicit tax on Soviet conscripts summarized above can be derived from: (1) the number of draft-affected personnel in the Soviet armed services, and (2) the disparity between their income (in money and in kind) and their civilian opportunity costs. The implicit tax for the period 1950 to 1972 is summarized in Table 1.

TABLE 1.—IMPLICIT TAX ON SOVIET CONSCRIPTS, 1950–72

Year	Million current rubles [1]	Percent of previously estimated expenditures for— Military manpower [2]	Explicit defense budget less pensions [2]
1950	89	2	1.1
1951	233	5	2.5
1952	382	6	3.6
1953	563	10	5.3
1954	647	11	6.5
1955	685	13	6.5
1956	670	16	7.1
1957	621	15	7.0
1958	602	14	6.6
1959	596	15	6.6
1960	589	20	6.5
1961	735	21	6.5
1962	757	18	6.1
1963	718	20	5.3
1964	760	22	5.8
1965	775	23	6.2
1966	830	24	6.3
1967	900	26	6.3
1968	1,022	29	6.2
1969	1,144	32	6.6
1970	1,194	32	6.8
1971 [3]	1,233	33	7.0
1972 [3]	1,274	34	7.3

[1] Computed from estimated number of conscripts (see table 2) and from the average tax per conscript (see table 6).
[2] The tax from column 1 as percent of expenditures on military pay and subsistence obtained from the following sources:
A. Bergson, The Real National Income of Soviet Russia Since 1928, p. 364.
N. Nimitz, Soviet National Income and Product 1956–58, Rand Memorandum 3112-PR, June 1962, pp. 2 and 33.
A. Becker, Soviet National Income 1958–64, 1969, p. 19.
Narodnoe Khoziaistvo SSSR v 1970 Godu.
[3] Based on preliminary statistical reports.

Numbers of Draft-Affected Personnel

Draft-affected personnel refer to those who serve not merely because of the compensation they receive but because of legal compulsion. The Soviet government established compulsory universal military service on May 29, 1918 and modified the pertinent legislation on June 12, 1918, and again in 1922, 1925, 1928, 1930, 1939, and 1967.[2] Under the 1939 law in effect through much of the postwar period, able-bodied males normally were subject to induction during the year of their 19th birthday, or of their eighteenth if they had completed secondary school. The term of active service for enlisted men was:

[2] Harold Berman and Miroslav Kerner, *Soviet Military Law and Administration*, Harvard University Press, 1955. *Vedomosti Verkhovnogo Soveta SSSR*, No. 13, 1965, p. 269 and No. 42, 1967, pp. 616–638.

Branch and rank:	Term (years)
Ground Forces and MVD (Ministry of Interior):	
Privates	2
Noncommissioned officers (NCO)	3
Air force (Including naval and coast guard): Privates and NCO's	4
Navy: Privates and NCO's	5

In practice the required durations of service have varied with the needs perceived by the executive branch of the government. In 1949–50 an extra year was added for privates and noncommissioned officers in the land forces.[3] On August 29, 1961, the leadership proclaimed that the release of certain military servicemen had been postponed until the signing of a German peace treaty. Some of these personnel were released gradually in the spring of 1962, and in September 1962 the government decreed that all of those whose term had been extended would be released, and that the next age cohort (born in 1943) would be called up. The government also announced in September 1963 that all those born in 1944 would now be called. The length of compulsory military service subsequently varied[4] as follows:

Branch	Required service (years)			
	1964	1965	1966–67	1968–70
Army	2	2	2–3	2
Air Force	4	4	3	2
Navy	5	4	4	3

The existence of the apparatus for compulsion neither guarantees its use nor determines the extent of its effect when used. Many members of the Soviet armed forces probably have served voluntarily. Virtually all commissioned officers may be regarded as having served willingly, providing at least a modicum of technical competence, loyalty, leadership, and willingness to accept substantial discipline, responsibility, and risk for remuneration at the established rates. Enlisted personnel serving a second or high term presumably do so at their own volition too. It is possible, of course, that career choices of some military professionals may have been different had they initially not faced the compulsion of the draft. On the other hand some first term enlisted personnel, serving on the same basis as involuntary conscripts may, nevertheless, be serving voluntarily themselves fully anticipating a military career. These, however, are subtleties that remain unquantifiable. For present purposes we have attempted simply to estimate the numbers of Soviet youths serving their first enlisted term as required under the law.

Numerical Estimates

Numbers of Soviet conscripts during 1950–1972 have been approximated from data on branch-of-service totals along with percentages of conscripts. The results, summarized in Table 2, show that after the mid–1950's the number of conscripts has remained stable at about 2.0 to 2.5 million. The apparent stability is in contrast to wide fluctuations in the number of 18 and 19 year old available, as indicated in Table 3, for past years. Moreover, a reduction in the future availability of military manpower may pose a policy problem for Soviet leaders.

[3] J. Mackintosh, *Juggernaut: A History of the Soviet Armed Forces*, New York 1967, p. 280.

[4] International Institute for Strategic Studies, *The Military Balance*, various years.

TABLE 2.—*Soviet military conscripts, 1950–72*

Year:	*Number of draftees*[1] *(In millions)*	Year—Continued	*Number of draftees*[1] *(In millions)*
1950[2]	2.4	1962	2.4
1951[2]	2.9	1963	2.2
1952[2]	3.5	1964	2.2
1953[2]	3.5	1965	2.0
1954[2]	3.5	1966	2.0
1955[2]	3.5	1967	2.0
1956[2]	3.1	1968	2.0
1957[2]	2.6	1969	2.1
1958[2]	2.4	1970	2.1
1959	2.3	1971	2.1
1960	2.2	1972	2.1
1961	2.5		

[1] Unless otherwise noted computed from service branch totals published by the International Institute for Strategic Studies in the *Military Balance* for various years 1959–1970 and from army and nonarmy percentages of conscripts in *Army Information Digest*, September 1959, p. 54, and in H. Baldwin, "Russia's Big Red Fleet," *Reader's Digest*, November 1970, p. 160.

[2] Sixty percent of armed services totals reported in R. Moorsteen and R. Powell, *The Soviet Capital Stock*, 1928–1962, 1966, p. 629.

TABLE 3.—POPULATON OF THE U.S.S.R., TOTAL POPULATION IN THE ABLE-BODIED AGES AND MALES OF MILITARY AGE, 1950–90 (AS OF JULY 1)

Year	Population of able-bodied ages (16 to 59/54, both sexes)		Males							
			18 to 19		18		19		18 to 34	
	Total	Annual increment	Total	Annual increment	Total	Annual increment	Total	Annual increment	Total	Annual increment
1950	103,345		3,815		1,811		2,044		23,163	
1951	104,848	1,503	3,364	−451	1,559	−252	1,805	−199	23,775	612
1952	106,708	1,860	3,101	−263	1,547	−12	1,554	−251	24,451	676
1953	109,184	2,476	3,212	111	1,670	123	1,542	−12	25,297	846
1954	112,033	2,849	3,524	312	1,859	189	1,665	123	26,331	1,034
1955	114,658	2,625	4,044	520	2,190	331	1,854	189	27,670	1,339
1956	116,873	2,215	4,593	549	2,408	218	2,185	331	29,163	1,493
1957	118,639	1,766	4,725	132	2,322	−86	2,403	218	30,455	1,292
1958	119,574	935	4,452	−273	2,135	−187	2,317	−86	31,423	968
1959	119,606	32	4,080	−372	2,948	−187	2,132	−185	32,079	656
1960	119,459	−147	3,480	−600	1,536	−412	1,944	−188	32,162	83
1961	119,622	163	2,597	−883	1,066	−470	1,531	−413	31,541	−621
1962	120,233	611	2,036	−561	974	−92	1,062	−469	30,549	−992
1963	121,245	1,012	2,112	76	1,142	168	970	−92	29,585	−964
1964	122,586	1,341	2,548	436	2,410	268	1,138	168	28,945	−640
1965	124,142	1,556	3,073	525	1,668	258	1,405	267	28,609	−336
1966	125,681	1,539	3,561	488	1,898	230	1,663	258	28,507	−102
1967	127,183	1,502	3,964	403	2,072	174	1,892	229	28,756	249
1968	128,632	1,449	4,209	245	2,141	69	2,068	176	29,321	565
1969	129,957	1,325	4,333	125	2,197	56	2,136	68	29,951	630
1970	131,738	1,781	4,430	97	2,238	41	2,192	56	30,487	536
1971	134,093	2,355	4,444	14	2,210	−28	2,234	42	30,810	323
1972	136,525	2,432	4,534	90	2,328	118	2,206	−28	30,943	133
1973	139,026	2,501	4,791	257	2,467	139	2,324	118	31,019	76
1974	141,645	2,619	4,914	123	2,451	−16	2,463	139	31,189	170
1975	144,355	2,710	4,927	13	2,480	29	2,447	−16	31,572	383
1976	147,147	2,792	5,019	92	2,543	63	2,476	29	32,199	627
1977	149,844	2,697	5,129	110	2,590	47	2,539	63	33,268	1,069
1978	152,200	2,356	5,225	96	2,639	49	2,586	47	34,818	1,550
1979	154,175	1,975	5,273	48	2,638	−1	2,635	49	36,448	1,630
1980	155,764	1,589	5,177	−96	2,543	−95	2,634	−1	37,820	1,372
1981	156,937	1,173	4,974	−203	2,435	−108	2,539	−95	38,824	1,004
1982	157,739	802	4,742	−232	2,311	−124	2,431	−108	39,450	626
1983	158,312	573	4,482	−260	2,175	−136	2,307	−124	39,714	264
1984	158,793	481	4,279	−203	2,107	−68	2,172	−135	39,742	28
1985	159,219	426	4,167	−112	2,063	−44	2,104	−68	39,659	−83
1986	159,551	332	4,080	−87	2,020	−43	2,060	−44	39,478	181
1987	159,946	395	4,030	−50	2,013	−7	2,017	−43	39,252	−226
1988	160,561	615	4,044	14	2,034	21	2,010	−7	39,073	−179
1989	161,315	754	4,118	74	2,087	53	2,031	21	38,836	−237
1990	162,077	762	4,222	104	2,138	51	2,084	53	38,516	−320

Source: Estimates as of June 28, 1972 computer run supplied by Mr. Murray Feshbach by Foreign Demographic Analysis Division, Department of Commerce. See also chapters in this composition by F. Leedy and M. Feshbach.

Compensation of Conscripts

Compensation of military personnel in the U.S.S.R. has taken a variety of forms, namely, monetary pay, subsistence in kind, and sundry special benefits and privileges. For purposes of this study it would be desirable to estimate values for total compensation of conscripts to compare with a similarly comprehensive measure of civilian compensation foregone. In fact it has been possible to present quantitative estimates for monetary allowances and subsistence in kind. Other benefits appear to defy meaningful quantification, but a thorough review of the available qualitative evidence has persuaded the author that they are unlikely to confer considerable special advantage in comparison with wage or salary supplements that may be enjoyed by their civilian counterparts.[5]

For monetary remuneration Soviet draftees have received a three-ruble-per-month pittance. Even though officially published data on military pay have been virtually nonexistent, a very large portion of the Soviet population must have been very well acquainted with many of the essentials on the rates of remuneration, especially at the lower ranks, and even with the limited and delicate East-West contacts there have been sufficient opportunities for verification.[6] Within the five-month period, September 1959 through January 1960, articles dealing with Soviet military pay appeared in each of the following periodicals: *Army Information Digest* (official magazine of the U.S. Department of the Army), *Air Force Magazine*, and *Army Navy Air Force Journal*. The degree of correspondence between data where overlaps occur (including in particular that apply to draftees) strongly suggests that the principal source of information was the same. The *Army Navy Air Force Journal* had stated in its prior issue [7] that details on Soviet military pay scales had been obtained from official U.S. and Soviet sources. J. Mackintosh and M. Koriakov, both professional students of the Soviet military with first-hand experience, report similarly low allowances.[8] Thus even if one were to reject official silence as a form of corroboration, there seems reason enough to accept the very low scale indicated for conscripts.[9]

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[5] The relevant literature includes the following items:
V. N. Dutov, ed., *Spravochnik po Pensionnomu Obespecheniiu Voennosluzhashchikh i ikh semei*, Moscow, 1968.
A. G. Gornyi, ed., *Osnovy Sovetskogo Voennogo Zakonodatel'stva*, Moscow 1966.
Franklin Holzman, *Soviet Taxation*, Harvard University Press, 1955.
Instruktsii Narodnogo Komissariata Truda SSSR: No. 277, Aug. 21, 1950.
Kodeks o L'gotakh dlia Voennosluzhashchikh i ikh Semei (1950).
G. F. Krivtsov and M. Ia. Parshin, *Spravochnik o L'gotakh Voennosluzhashchim Srochnoi i Sverkhsrochnoi Sluzhby i ikh semiam*, Moscow 1967.
V. A. Lukashuk, ed., *Zhilishchnobytovye Voprosy*, Moscow 1964.
Postanovlenie Soveta Narodnykh Komissarov: Aug. 23, 1931; No. 937, Sept. 1, 1943.
Postanovlenie Soveta Ministrov SSSR: Aug. 26, 1948; No. 1843, May 7, 1949; No. 108, Feb. 1957; No. 291, Mar. 15, 1957; No. 1233, Nov. 5, 1959; No. 1108, Oct. 25, 1963.
Postanovlenie Tsentral'nogo Komiteta Kommunisticheskoi Partii Sovetskogo Soiuza i Soveta Ministrov SSSR: May 17, 1956; No. 270, Mar. 5, 1963.
Vedomosti Verkhovnogo Soveta SSSR: No. 42, 1941; No. 18, 1942; No. 17, 1943, No. 7, 1953.

[6] It is interesting to note that recent semiofficial *obiter dicta* regarding some military rates of pay have maintained a dogged silence about compensation of draftees.

[7] January 23, 1960, p. 32.

[8] Mackintosh, loc. cit. and M. Koriakov, "The Military Atmosphere," in B.H.L. Hart, *The Soviet Army*, London 1956.

[9] Soviet official data on military pay at the intermediate ranks as reported by several Soviet authors confirm broadly the accuracy of information previously available in the West. V. N. Dutov, op. cit., I. F. Pobezhimov and B. A. Viktorov, eds., *Spravochnik Ofitsera po Sovetskomy Zakonodatel'stvu*, Moscow 1966.

While in many cases, supplements have constituted an important component of Soviet officers' compensation,[10] there seems little reason to suppose that monetary supplements have been similiarly significant in the remuneration of conscripts.

Monetary Value of Conscripts' Income in Kind

The nature of Soviet military missions and activities, as in most armed forces, often has dictated provision of food, clothing, shelter, medical care, *et cetera* directly to the servicemen. Given the nominal financial remuneration of Soviet conscripts, a large component of their material compensation has been in kind, so that an evaluation of its monetary worth would be extremely useful.

Previous estimates [11] of approximately thirty-three rubles per month for the average value of rations plus other income in kind during 1956–1964 now seem to enjoy a measure of semiofficial confirmation [12] in the form of the twenty-five ruble per month rations allowance reported for senior noncommissioned professionals. To obtain a wider perspective the time series of *current* ruble values for *average* military subsistence has been extended back to 1950 and forward to 1972 with reference to an index of retail prices.[13]

Can we say anything about the conscript's income-in-kind relative to the average? Judging by the gross inequality in monetary pay, one would anticipate some inequality also in the distribution of income-in-kind. Koriakov, a former Soviet army officer, confirms that a very substantial inequality in the distribution of rations has existed.[14] Indeed, even the Soviet official literature has acknowledged a distinction between norms for officers' and enlisted men's rations.[15] Conscripts rarely, if ever, lived in housing any better than barracks, whereas career enlisted men often have been permitted to reside with their families. Everything considered, it appears that conscripts' income-in-kind amounted to perhaps eighty percent of the average for all servicemen.

Thus the value of military subsistence varied approximately as follows:

CURRENT VALUES OF MILITARY SUBSISTENCE

[Rubles per month]

Year	Average	Conscript
1950	44	35
1951	41	33
1952	39	31
1953	35	28
1954	34	27
1955	34	27
1956–72	33	27

The conscript's income-in-kind amounted to approximately ten times his monetary allowance, and together they added up to about thirty

[10] See L. Predtechevskii, *Sovetskii Morskoi Ofitser*, Munich 1959.
[11] A. Becker, *Soviet National Income 1958–1964*, Berkeley 1969, and N. Nimitz, *Soviet National Income and Product 1956–58*, Rand Memorandum 3112-PR, Santa Monica, June 1962.
[12] V. Dutov, op. cit.
[13] For a description of methods used see E. Brubaker, "Some Models of Technical Progress in the Soviet Nonagricultural Nonresidential Sector," in J. Thornton, ed. *Mathematical Models of Planning* (forthcoming).
[14] M. Koriakov, op. cit., p. 419.
[15] I. F. Pobezhimov, op. cit., p. 62.

rubles per month during most of the postwar period. How does this compare with the civilian earnings he had to forego?

Civilian Opportunity Costs

In order to approximate conscripts' opportunity costs evidence has been assembled showing the average remuneration of civilians whose attributes affecting earnings (age, physical condition, work experience, sex, and educational attainment, for example) were similar to those of the recruits. Given the latter's youthfulness and inexperience, it is clear that their earning potential has been less than average civilian wages and salaries. On the other hand, it is possible to identify sizeable groups whose wages have been lower, and, therefore, an appropriate opportunity cost must be well above the minimum of wage and salary earnings. Thus the approach taken here has been to find the approximate position of physically and mentally healthy male nineteen to twenty-six year-olds in the distribution of civilian wages and salaries. Before attempting to estimate more precisely the appropriate position, however, it will be useful to describe as accurately as possible the attributes of Soviet servicemen that may have a significant influence on their earning potential.

Conscripts' Attributes

Soviet draftees have almost always been males. The age of those in service during peacetime has been within the range of nineteen to twenty-six years, and it seems quite likely that they enjoyed better health both in comparison with the labor force in general and with medical rejects from their own age-sex cohort in particular.

The growing need of the armed services for technically competent persons, officers and enlisted men, has been emphasized in recent Soviet literature. Thus, for instance, it has been claimed that by the middle of the 1960's ninety percent of officers had completed at least secondary school, and a minimum of twenty-five percent had completed the undergraduate program of an institution of higher education. At the same time more than ninety percent of enlisted men in the army and navy had completed higher, secondary or partial secondary education.[16] M. S. Novikov[17] (apparently with reference to the latter 1960's) has asserted that about seventy percent of youths recruited for military service have attained competence in one technical specialty or another, and, finally, Marshall I. Iakubovskii[18] has stated that about fifty percent of the personnel in the army and navy have completed secondary or higher education.

Western data also suggest levels of educational attainment by members of the armed forces substantially higher than those prevailing in the civilian labor force as is shown in the following tabulation:

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[16] K. V. Chernenko and N. I. Savinkin, *KPSS o Vooruzhennykh Silakh Sovetskogo Soiuza*, Moscow 1969, p. 4. S. S. Lototskii et. al., *Armiia Sovetskaia*, Moscow 1969, p. 430. M. V. Zakharov, ed., *50 Let Vooruzhennykh Sil SSSR*, Moscow 1968, p. 517.

[17] M. S. Novikov, ed., *V. I. Lenin i Tyl Sovetskikh Vooruzhennykh Sil*, Moscow 1970, p. 100.

[18] *Sotsialisticheskaia Industriia*, March 25, 1971, p. 3.

EDUCATIONAL ATTAINMENT IN THE MILITARY AND IN THE CIVILIAN MALE LABOR FORCE [1]

[Percent of sector total]

Sector	Educational attainment	
	Higher	Specialized secondary
Military	6	46
Civilian	3	3

[1] Derived from data in A. S. Goodman, "Estimates and Projections of Specialized Manpower in the U.S.S.R.: 1950–75," U.S. Bureau of the Census, International Population Reports, series P–91, No. 21, Washington, D.C., 1970. R. H. Reed, "Estimates and Projections of the Labor Force and Civilian Employment in the U.S.S.R.: 1950–75," U.S. Bureau of the Census, International Population Reports, series P–91, No. 15, Washington, D.C., 1967.

The disparity between military and civilian attainment of specialized secondary education is especially striking. In fact, as may be seen in Table 4, during the 1950's the number of males with specialized secondary education was greater in the armed services than it was in all branches of the civilian economy combined. Looked at in still another way the forty-six percent of military personnel with specialized secondary education in January 1959 may be compared with the two to seven percent of the civilian labor force (male and female) during the period 1950–1968.

TABLE 4.—*Graduates of specialized secondary schools in Soviet military service, 1950–68* [1]

[Percent of male specialized secondary school graduates in the labor force]

Year:	*Percent*	Year—Continued	*Percent*
1950	78.6	1962	46.7
1955	73.7	1963	44.1
1957	60.0	1964	40.3
1958	56.6	1965	37.7
1959	53.7	1966	35.5
1960	48.2	1967	34.8
1961	42.8	1968	33.4

[1] A. S. Goodman, *Estimates and Projections of Specialized Manpower in the U.S.S.R.: 1950–75,* U.S. Bureau of the Census, International Population Reports, Series P–91, No. 21, p. 32.

There also have been many *enlisted men* with specialized secondary education. The total in the armed services with this educational attainment, including officers, was estimated at 1,722,000. The number of officers in the total armed forces of 3,623,000 must have been well under one million. Of these many either had completed higher education or had not completed secondary education leaving something on the order of a half million who had completed only secondary education. Thus over one million or perhaps thirty to forty percent of enlisted men had completed specialized secondary education. This amounts to about ten times the rate applicable to the civilian sector.

Finally, many of the servicemen with specialized secondary education were men serving beyond their required term. In the total population there were only 736,853 males ten to twenty four years of age who had completed specialized secondary education.[19] Some of these would

[19] USSR Central Statistical Administration, *Itogi Vsesoiuznoi Perepisi Naseleniia 1959 goda,* Moscow 1962.

have not yet entered the service. Some would have been deferred. Some would have been rejected on medical grounds. And many would have been discharged following a stint in the service. Apparently, there were few, if any, first term servicemen with specialized secondary education who were twenty-five years of age or older. Thus at least 400,000 males with specialized secondary education had remained in the armed services beyond their first tour of duty.

While in all of the above there are no precise implications for the educational attainment of conscripts alone, one gets the impression that it probably was relatively high. In any event it seems quite likely that the educational attainment of recruits was no lower than that of males generally between ages twenty to twenty-four, especially since draftees in service or recently discharged must have constituted a sizeable percentage of the approximately ten million persons in this category.

How then did Soviet males aged twenty to twenty-four years compare in educational attainment with the rest of the working age population? Data presented in Table 5 provide some useful evidence. The disparity in percentages relating to higher education stem of course from the fact that many youths in this age group have not had enough time to complete higher educational programs. The twenty to twenty-four year old males appeared, however, to have a slightly greater frequency of attainment of specialized secondary education and a very decidedly greater frequency of attainment of general secondary education.

TABLE 5.—U.S.S.R.: EDUCATIONAL ATTAINMENT OF PERSONS IN SELECTED AGE-SEX COHORTS, JANUARY 1959 [1]

[Percent of total in the corresponding age-sex cohort]

Age-sex cohort	Higher	Incomplete higher	Specialized secondary	General secondary
Male:				
20 to 24	1.0	2.6	6.5	13.6
25 to 64	4.4	1.3	6.5	4.7
Male and female 25 to 64	3.5	1.1	5.9	4.3

[1] U.S.S.R. Central Statistical Administration, Itogi Vsesoiuznoy Perepisi Naseleniya, 1959 goda, pp. 74 ff.

Distribution of Civilian Wages and Salaries

The distribution of wages and salaries in the Soviet socialized sector (excluding collective farms) during 1966 is presented in Table 6. The data represent a principal conclusion by P. Wiles and S. Markowski from their very painstaking analysis of fragmentary evidence presented in the Journal of the U.S.S.R. Council of Ministers' State Committee on Problems of Labor and Wages.[20] In many respects internal consistencies and apparent consistencies with other fragments

[20] P. J. D. Wiles and S. Markowski, "Income Distribution under Communism and Capitalism." *Soviet Studies*, April 1971, pp. 487–512. *Sotsialisticheskii Trud*, No. 10, 1968, pp. 126–35.

of knowledge on Soviet wages and salaries, such as arithmetic means reported in official statistical handbooks, minimum wage laws, inter-industry wage differentials, etc., suggest that the Wiles-Markowski distribution may be a reasonably close approximation to reality. Furthermore the authors of the Soviet article assert that the basic distributional form seems relevant to various smaller sectors of the economy, and that it has been remarkably stable over time. Given this quite unusual and valuable set of information about the distribution of Soviet wages and salaries, we need only to establish the position in it occupied by the civilian analogues of conscripts to obtain a value for the average earnings foregone by military recruits.

TABLE 6.—*Distribution of wages and salaries in the Soviet economy (Narodnoe khoziaistvo) in 1966* [1]

Wages or salary income (*Rubles per month*) :	*Percent of all wage and salary earners*
30 to 40	2
40 to 50	9
50 to 60	9
60 to 70	12
70 to 80	10
80 to 100	18
100 to 120	14
120 to 140	10
140 to 160	5
160 to 200	10
200 to 300	2

[1] P. Wiles and S. Markowski (p. 503). See footnote 20 for complete citation.

AVERAGE EARNINGS FOREGONE

Among groups in the Soviet labor force whose average earnings almost certainly have been lower than those of able-bodied and able-minded nineteen to twenty-six year-old males are younger males, females of approximately the same age, part-time workers, and nineteen to twenty-six year-old males excused from military service because of physical or mental deficiencies. These low-wage groups constituted at least twenty-five to thirty percent of the labor force.[21] Thus it may be determined by reference to Table 6 that conscripts' civilian earnings foregone may have amounted to sixty-four rubles per month in 1966. An index of civilian wages suggests further that monthly earnings foregone increased from forty rubles in 1950 to about eighty-five rubles in 1972.[22]

Disparities between military pay and subsistence and foregone civilian earnings have been tabulated in Table 7. The values rise steadily from about thirty-seven rubles per year in 1950 to more than 650 rubles per year in 1972 reflecting the similarly steady rise in civilian earnings.

[21] Derived from data in USSR, Central Statistical Administration, op. cit., p. 51 and Reed, op. cit., p. 15.

[22] Estimated from data in P. J. D. Wiles and S. Markowski, op. cit., op. 503; U.S. Congress, Joint Economic Committee (JEC), *Soviet Economic Performance*, Washington, 1968, p. 67; M. Feshbach and S. Rapawy, "Labor and Wages," in U.S. Congress, JEC, *Economic Performance and the Military Burden in the Soviet Union*, Washington, 1970, p. 82; *Narodnoe Khoziaistro SSSR v 1970 gody;* and statistical releases from the Soviet press.

TABLE 7.—*Disparity between Soviet conscripts' pay plus subsistence and their civilian opportunity cost*

[Rubles per year]

Year:		Year—Continued	
1950	37	1962	316
1951	80	1963	326
1952	109	1964	346
1953	161	1965	388
1954	185	1966	415
1955	196	1967	450
1956	216	1968	511
1957	239	1969	545
1958	251	1970	588
1959	259	1971	624
1960	268	1972	660
1961	294		

CONCLUSION

By the early 1970's implicit taxes on Soviet conscripts appear to be a significant part of the hidden portion of the Soviet defense outlays. These taxes are approaching an amount equivalent to approximately ten percent of the explicit defense budget and about thirty-five percent of expenditures on Soviet military manpower. These data very well may understate somewhat the extent of hidden expenditures if civilian wages understate the contribution of the Soviet labor force to output.[23] Furthermore, the hidden expenditures seem likely to grow along with the trend in growth of civilian productivity. Especially in a period during which American military expenditures rise due to uncovered taxation, international comparisons of levels and trends in military spending require an accurate accounting for the opportunity cost of Soviet military conscripts.

[23] The large size of tax receipts and retained earnings of enterprises relative to wage and salary incomes arouses suspicions that the latter may not reflect adequately the contribution of labor to the output of the economy. See S. Anderson, *Soviet National Income, 1964–1966, In Established Prices,* Rand Memorandum 5705–PR, Santa Monica, September 1968.

VALUE AND BURDEN OF SOVIET DEFENSE

By HERBERT BLOCK

CONTENTS

SUMMARY

The Soviet plan is in trouble, not so much because foul weather has affected the harvest but because the economic system is inefficient outside a small high-priority sector working for the defense and space establishment. Is there a prospect of resources in talents, equipment, and materials being shifted from military to civilian activities? How large are the resources that the military do use up?

Answering these questions is an exercise in meta-Intelligence. The Soviet defense economy is shrouded in secrecy. Whether this secrecy pays off is still another question.

The Soviet military establishment is partly observable. It is therefore possible to compile an inventory of its manpower and material. Ideally, by costing the components at ruble prices, the U.S.S.R.'s defense outlay and defense burden can be measured; by costing them at dollar prices the annually produced package of defense (and space) goods and services can be compared with its counterpart in the U.S., on the theory that the value ratio is indicative of the Soviet-U.S. strategic power balance. The method just described—the "building block" method—has its share of pitfalls and by its very

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nature it is restricted to classified research. Those not privy to its findings have to interpret Soviet statistics on budgets, output, labor, etc. in a general economic and political framework. They engage in the exegesis of obscure texts, guess at unexplained residues, hunt after analogues, and indulge in assumptions. Research on Soviet defense is the feast of the assumption.

Thus, without going into methodological and statistical details, we mention that for 1969 calculations of Soviet defense and space spending range from 23 to 36 billion current rubles; this includes military and space R. & D. estimated between 3 and 14 billion rubles. There exists more of an agreement on the defense burden measured as the share of defense and space in the Gross National Product (GNP). The views cluster around 10 percent, with low and high extremes of 6 and 15 percent. But the ruble value of the GNP itself is contested. There is also disagreement on whether in the Brezhnev era the share of defense has inched up or down. Dollar values for Soviet defense range from 48 to 84 billion dollars for 1968 and somewhat higher for later years. An estimate of Soviet military and space R. & D. for 1970 of 16 to 17 billion dollars was given much publicity.

Different though the figures are, the researchers have the mental picture of a Soviet Union producing, in comparison with the U.S., an annual defense package of roughly equal value, with an R. & D. component possibly exceeding ours. This spells a state of "approximate parity". Two war machines with an equal "product" or even equal reserves and stocks may still differ in their military efficiency. Only the dreaded contingency of a conflict could decide this issue.

Superior American economic power and efficiency is beyond any doubt. The Soviet economy provides a population 18 percent larger with less than half the goods and services, employing 45 percent more labor than the U.S. and investing in real terms as much as this country. But because the civilian economy (above all agriculture) is inefficient in comparison with the defense sector, the latter's share in the national product is relatively small.

The Soviet regime is highly conservative and not inclined to change its institutions irrespective of their inefficiency. Nor should one expect a major shift of resources from defense to civilian economy. The country's leaders wish to negotiate from a position of strength and feel duty-bound to prepare for dangers that might arise in years to come. They do not want to impair defense industries fairly well set up by using choice inputs in a civilian environment where talents and materials would quickly lose some of their quality. The regime would, however, welcome savings on the margin provided they do not affect the balance of strategic power to its disadvantage.

TABLE 1.—SOVIET DEFENSE AND SPACE EXPENDITURES

	1960[1]	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
A. OFFICIAL SOVIET STATISTICS (BILLIONS OF CURRENT RUBLES)														
1. Ministry of Defense budget*	9.3	11.6	12.6	13.9	13.3	12.8	13.4	14.5	16.7	17.7	17.9	17.9	17.9	17.9
2. Defense budget as percentage of total expenditures	12.7	15.2	15.3	16.0	14.4	12.6	12.7	12.6	13.0	12.8	11.6	10.9	10.3	9.9
3. Science from Government budget and other sources, including investments*	3.9	[2] 3.8	[2] 4.3	[2] 4.7	[2] 5.2	6.9	7.5	8.2	9.0	10.0	11.7	13.0	14.4	15.5
4. Science (explicit Government budget only)	2.31	2.65	2.98	3.44	3.95	4.26	4.61	5.05	5.52	5.88	6.54	7.0	[3]	[3]
5. Science (all-union budget only)	1.87	2.18	2.48	2.97	3.46	3.74	4.10	4.53	4.96	5.29	5.94	[3]	[3]	[3]
B. WESTERN CALCULATIONS														
I. Estimated total defense and space expenditures in rubles:														
1. Stanley H. Cohn (billions 1955 rubles):[4]	13.2–11.5	16.4–14.1	18.4–16.2	20.4–17.8	20.6–17.8	20.9–17.6	22.5–18.8	24.7–18.8	28.2–20.5	30.7–23.3				
2. Stanford Research Institute (SRI) (billions current rubles)						22.5		29.0	32.5		39.0			
3. Institute of Strategic Services, London (ISS) (billion rubles)[5]	12.15	16.11	17.41	18.09	17.28	16.65	17.41	18.85	21.69	23.0	24.25	24.75		
II. Estimated Soviet defense and space R+D expenditures (in rubles):														
1. Stanley H. Cohn (in billion 1955 rubles)[4]	2.6–1.3	3.1–1.6	3.4–1.7	3.9–2.0	4.5–2.3	5.0–2.5	5.4–2.7	6.0–3.0	6.3–3.2	6.9–3.5				
2. Stanford Research Institute (in billion current rubles)	5.5					10.0		10.5			15.5			
3. Nancy Nimitz (RAND)	1.6–2.0					2.6–3.0			3.0–3.9					
4. William T. Lee											10.0–14.0			

See footnotes at end of table.

TABLE 1.—SOVIET DEFENSE AND SPACE EXPENDITURES—Continued

	1960[1]	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
III. Soviet defense and space as percentage of GNP:														
1. Stanley H. Cohn:														
Using constant 1955 prices[4]	9.7–8.6			12.8–11.4		11.7–9.9				12.8–10.0				
Using current prices[4]	9.2–8.4			11.5–11.1		10.1–9.1				10.4–10.1				
2. Stanford Research Institute						9.5				10.0	10.4			
3. Institute of Strategic Services, London										11.0	11.0			
4. Arms Control and Disarmament Agency (ACDA)		6–10	6–10	6–10	6–10	6–10	6–10	6–10	6–10	6–10	6–10			
5. Abraham Becker (RAND)	not more than 10 percent between 1958–63													
6. David E. Mark (Department of State)										10				
IV. Estimated total defense and space expenditures (billions of current dollars):														
1. Stanford Research Institute						45.5		56.3	61.9		74.3			
2. ACDA[5]		39.0	43.0	46.0	46.0	45.0	46.0	50.0	56.0	60.0	65.0			
3. Institute Strategic Service, London[6]	27.0	35.8	38.7	40.2	38.4	37.0	38.7	41.9	48.2	51.1	53.9	55.0		
4. William T. Lee									52–62					
5. Michael Boretsky									84.0					
6. David E. Mark										60.0				
V. Estimated military and space R+D expenditures:														
1. Stanford Research Institute (billions current dollars)	8.9–12.5										16.2			
2. John S. Foster, Jr. (Department of Defense) (billions 1968 dollars)											16–17			

[1] Ruble data for 1960 converted to new rubles.
[2] Excluding investments in research and development.
[3] Not available.
[4] Cohn's alternatives "A" and "B".
[5] Exclusive of civilian space outlays.
[6] Reconverted from dollars into rubles, using the ISS exchange rate of 0.40–0.50 rubles equals $1.
* 1972 and 1973 plan, otherwise actual expenditures.
Sources and explanations: See text.

The following comments on the U.S.S.R.'s defense spending are written at a time when in world politics enterprises of great pith and moment are being undertaken and when in world economics new policies are being tested in response to bewildering troubles. On another plane, namely in scholarly research, dissatisfaction with our understanding of Soviet military and space activities has given rise to new attempts at measuring them.

World Political and World Economic Setting

In foreign affairs there are still only two superpowers. But what used to be an unquestionable superiority of America over the U.S.S.R. has given way to an (ill-defined and unstable) condition of "parity" or "approximate parity". Furthermore, the rise of new centers of power and ambition has made the rivalry between the superpowers more "complex" (a favorite word with perplexed Soviet observers).[1] Thus the great powers are all jockeying for position, a condition which in turn gives smaller powers opportunities to advance their cause.

While a new power configuration is formed or simply forming, leaders in the West and in the East are removing obstacles to their freedom of maneuver. They try to control inconvenient conflicts in this or that part of the world. They foster commercial relations between their nations because existing restrictions have lost much of their meaning and they are now seeking the positive benefits of trade. Finally, in the hope of improving or, at least, maintaining their strategic position, they are exploring ways to restrain a costly arms race. This is where the economic problems come in.

They are troubling a world economy even though or exactly because it is growing lustily. Changes in behavior, hardly understood, are upsetting existing economic mechanisms. This applies to East and West. But the powers that be are reacting differently. The West is disposed to improvise, experiment, and innovate even in affairs commonly under the influence of conservatives (currency management!), while in the East the sons of the October Revolution stick to tradition (a young tradition, as traditions go). The creed of a Spanish Falangist who proclaimed for his own country "development sí un, change no!" is being imposed on the Soviet Union and its associates.

Soviet Plan Failures

At times difficulties inherent in a specific system peak. There are currency crises in the West. In the U.S.S.R. the plan is in trouble. The Soviet authorities blame the failure largely on the weather ("the worst weather in a hundred years"), and the weather was bad indeed. Unofficially, Soviets are willing to admit that the breakdown of the plan in as well as outside of agriculture has more basic reasons than whims of the weather. With growth sought but change disdained, the Soviet Government has limited itself to temporary expedients such as massive imports of grain. In this effort it has been favored by circumstances in world politics and the world economy. But emergency

[1] A pentagonal power configuration existed before: the Congress of Aachen of 1818 formally recognized five Great Powers, which engaged in a foreign policy balancing act.

imports will sooner or later absorb means desired for imports of Western equipment and technology. Such imports are dear to a regime of technocrats who believe that better machines will solve their economic problems (without, however, creating social-political problems—a strange attitude on the part of Historical Materialists).

While the system is not to be changed (at least, not yet!), policies and priorities may be adapted to circumstances. The decline of farm output blamed on the weather, and the general shortfall of the plan blamed on administrators, managers, and workers unable to reach exaggerated productivity targets, have, as a matter of course, undone the plan for the past year and the present, but adjusting to realities is not the same as "reordering of priorities". The priorities have actually been maintained, at least for the time being. This is where defense might become an issue. Is it possible—or not—to help solve short-run or long-run problems by redistributing material and human resources claimed by the military and space establishment? The question, in turn, leads to our perception of size, structure, and development of Soviet defense, a perception derived from Soviet published sources and from Western research.

The Soviet Defense Ministry Budget

The U.S.S.R. publishes, in the context of its Government budget, a series representing the annual appropriation for its Ministry of Defense; second, figures for "science" allocations (supplemented by additional "science" outlays from funds either inside or outside of the Government budget); and, third, budget items or simply residues which include or are suspected to include dimly perceived expenditures for defense and defense-related activities. The latter are thought to be located in the so-called "social-cultural" budget but outside its "science" item, in "financing the national economy" and in various residual amounts that appear when the itemized categories are deducted from budget totals. (See Table 1.)

It is known from Soviet literature that atomic energy production, strategic and military stockpiling, the civil defense organization, some military training, and, at least partly and at times, the paramilitary police and foreign military aid have been endowed through this group of budget categories. The extraordinary secretiveness of the Soviet defense and space economy has prevented all but a few details from surfacing. Over time the ratio of overt to covert defense outlays has fluctuated significantly.

The main defense allocation, the budget of the Ministry of Defense, is published as a single figure. It rose considerably (at current prices but also in real terms) from the late 1940's to the mid-1950's, receded somewhat at the end of that decade and almost doubled between 1960 and 1969. For the study of military-economic realities the explicit defense budget is pretty barren. It is meant to convey a political message of alarm or reasonableness, depending on circumstances. Thus in mid-1961 the defense appropriation for the calendar year was dramatically raised from 9.3 to 12.4 billion rubles, reportedly because Khrushchev, after learning from *Fortune* Magazine of an impending $3.5 billion increase in U.S. national defense, wanted to match the sum ($3.1 billion rubles at the official rate of exchange at that time). Not

even Soviet marshals were able to spend that much money in six months. Then, starting in 1963, authorized (planned) and actual defense expenditures began to become identical year in and year out, irrespective of the cost overruns Khrushchev had complained about, or of such unforeseen happenings as the invasion of Czechoslovakia or the varying degree of Sino-Soviet tension. Finally, since 1969 and except for a minute increase in 1970, the defense budget has been stable, signaling to the Soviet people and the world at large a stance of cautious watchfulness coupled with a professed concern for civilian requirements on the evidence of a declining share of "defense" in overall budgets that happen to expand more rapidly than the economy as such.

Official Soviet Data on "Science" Outlays

Outlays for science have skyrocketed from humble beginnings in the years immediately after the war. The "science" item, presented with pride in the Finance Minister's annual budget speech, consists of different components which are disclosed not necessarily at the time the budget is enacted but in statistical handbooks appearing months or years thereafter. There is, first of all, a "science" appropriation included in the budget section called "social-cultural measures" and, second, a smaller portion being financed from "other sources", i.e. organizational and enterprise funds. Enterprise funds are, in general, derived from profits; it is, however, likely that some funds from "other sources" are drawn from budget allocations other than the "science" item in the "social-cultural" category. The question arises whether outlays listed under organizational science funds are actually paid by the Ministry of Defense. It is believed that, if there is such double-counting, the amounts are small; in other words, expenditures for military and space "science" appear to be real increments to the open defense budget.

In this plethora of "science" statistics (compared with the monolithic "defense" appropriation; everything is relative!), there exists still another breakdown. Years, often many years after the event, figures are published for that part of the Government "science" budget that is spent by what we would call Federal authorities, i.e. in the U.S.S.R. the All-Union budget, with the rest allocated to the U.S.S.R.'s constituent units, the Republics. The All-Union "science" share has increased between 1950 when it was 76.9 percent of the total, and 1970—the latest year thus documented—when it was 90.8 percent. Defense is, of course, a responsibility of the Union, and it is assumed (research on Soviet research is paved with good assumptions) that the science expenditures of the Republics are not defense-related. This may be so; they are at any rate smallish (1970: 610 million rubles).

"Science" activities require large current expenditures and some investments. Published Soviet figures are sometimes inclusive and sometimes exclusive of investments (for instance, up to the plan figure for 1970 Finance Minister Garbuzov presented the "science" data net of investment in R. & D., then suddenly he included them). These investments pose not only the statistical problem of recognizing them as such but also a conceptual problem. In the larger context of general defense expenditures inclusion of investment in armament

plants would be double-counting because, on principle, a corresponding share of the investment costs is charged in the price of armaments (though under Soviet conditions the charge may be low). Science-related investments may or may not deserve a similar statistical treatment. Insofar as they represent installations in the nature of final, though durable goods—e.g., a missile pad—and are written off upon commissioning, their inclusion in current R. & D. outlays appears justified. This is probably the case in regard to a considerable portion of "science" investments but the question, as so many others, is not answerable.

Expenditures for "science", from whatever source, pay for activities in natural science and technology and also (in contrast with American concepts) in the social sciences, though the outlays for the latter are moderate. The total may be divided into military R. & D. and space activities, civilian space activities, and other civilian R. & D. Whether civilian space efforts should or should not be counted as "defense" is an open question. Exploration of the cosmos is not a purely scientific affair because the military aspects of space technology are closely interwoven with other strands. In this paper, defense includes all space efforts, if only because unclassified breakdowns by military and nonmilitary application are not at hand. As a result, all space costs must be lumped for the United States as well, if a comparison is to be meaningful.

Are the official "science" outlays all-inclusive? Table 1 shows that they have increased over the years by leaps and bounds; yet Soviet sources mention still higher figures on occasion. In 1956, when the planned appropriation was 13.6 billion old rubles (10 old rubles became 1 new ruble in 1961), Joe Adamov of Radio Moscow asserted that "the U.S.S.R. gave more than 30 billion rubles to its research institutions".[2]

The difference is large indeed; Adamov's figure was never explained and never repeated. Recently "science" outlays slightly exceeding the official figures, have been mentioned to Western organizations; a different price basis or coverage may explain the deviation.

"Science" and "R. & D." are by their very nature vague concepts: in particular, they are open-ended toward the production side, and it is by now commonly assumed that construction and testing of prototypes are only in part financed through "science" budgets; again nobody knows for sure how much of the cost is paid out of the "National Economy" budget or out of enterprise funds. Researchers make different assumptions on size and source of the outlays, and from their respective assumptions flow conclusions that vary correspondingly. In assessing the series on defense and science, cost comparability over time has to be considered. This is a difficult task given Soviet reluctance to reveal (perhaps to explore) price developments; it calls for further assumptions.

Defense as a Share of the Soviet Budget and Soviet-Style National Income

Limiting ourselves to official Soviet data for 1972, the following picture emerges: The Ministry of Defense is reported to have obtained

[2] *New York Times*, November 21, 1957.

and spent 17.9 billion rubles. "Science" absorbed 14.46 billion rubles. If only half of the "science" outlays were defense-related (a rather low percentage) and if we disregard entirely defense activities financed neither through the Ministry of Defense nor from "science" allocations, the total defense bill would exceed 25 billion rubles.

The explicit budget of the Defense Ministry constitutes only one-tenth of all Government expenditures, but the latter include as budget grants almost half of the country's investments (the rest being financed from retained enterprise profits and through bank credits, of course under close Government supervision). From another point of view half of the Government budget endows the Union, the other half the Republics and their constituent bodies. Defense, as calculated from the Ministry and the "science" figure, would represent a good third of a Soviet budget redrawn along the lines of the U.S. Federal budget.

A figure for the 1972 Soviet national income has not yet been published but it can be expected to arrive at 316 billion rubles. It would be almost identical with the GNP estimated in 1968 rubles underlying the dollar series published in a recent State Department study.[3] But this is coincidence; the differences (services added to the Soviet-style material product and the large turnover tax removed) simply offset each other. A defense outlay of at least 25 billion rubles relates to the national income (which may be slightly higher in 1972 rubles) as roughly 8:100. (One cannot say: constitutes 8 percent because service in the military establishment is "unproductive", i.e. does not create national income[4] while, on the other hand, defense supplies are, in general, not charged turnover tax.)

In a statement made in June 1972 the famous Soviet scientist Andrei Sakharov expressed—in fact, repeated—the opinion that "in no country does the portion of military expenses, relative to the national income, achieve such dimensions as in the U.S.S.R. (nearly 40 percent)". It is not known how his estimate was arrived at except that it is close to similar calculations that have recently become known in the West.[5] They are set forth in a *Samizdat* paper by Aleksandr Gol'tsov and Sergey Ozerov on *Distribution of the National Income of the USSR* and issued in Leningrad in 1971. The authors give evidence of some mathematical training but are not sufficiently familiar with the intricacies of national accounting, particularly in international comparisons.

By comparing for the year 1969 net personal income with the Soviet "consumption fund", Gol'tsov and Ozerov arrive at a defense expenditure (not counting investment in armament plans or civilian "science" outlay) of 80 billion rubles. This, at established Soviet prices, is 29 percent of a national income (including services, i.e. in the Western style) of 276 billion rubles. By adjusting Soviet prices in their own fashion, the authors increase the defense share to either 41 or 51 percent. The corresponding dollar figures are $54 and 97 billion. Soviet

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[3] "The World's Product at the Turn of the Decade", Department of State, RESS-54, September 12, 1972, p. 9.

[4] Soviet statistics follow Marx who, in turn, followed Adam Smith who wrote: "The sovereign . . . with all the officers both of justice and war who serve under him, the whole army and navy, are unproductive labourers. They are the servants of the public, and are maintained by a part of the annual produce of the industry of other people. Their service, how honourable, how useful, or how necessary soever, produces nothing for which an annual quantity of service can afterwards be procured," (*The Wealth of Nations*, Book II, Chapter III).

[5] See Kaiser article in *The Washington Post*, April 13, 1973.

personal consumption is estimated at $40 billion, i.e. only 31 or 21 percent of the national income and per head of the population a mere $166. The Soviet national income is given as either $130 or 190 billion, i.e. 17–25 percent of the American GNP.

The calculation rests on numerous speculative assumptions (the share of agriculture in the Soviet national income—given as 9 percent—plays a crucial role in the computation and is derived from the ratio of this share and the agricultural labor force in 70 countries, or it is assumed that the Soviet national income was no less than that of Japan), furthermore on a tenuous comparison between estimated Soviet net personal income and the Soviet consumption fund (misinterpreted as including the entire defense bill), and finally on a conversion to dollars without considering the different purchasing power equivalents that prevail from sector to sector of the economies thus compared.

The authors would not have gone astray if Soviet scholars were free to engage in an exchange of opinions with their Western colleagues and if the Soviet Government would supply its population with better statistics about their own economy. Soviet citizens are as interested in their defense burden as Westerners, and in light of the paper just mentioned—which appears to have impressed many thoughtful readers not schooled in this special field—one wonders whether the U.S.S.R.'s penchant for secrecy is not simply a self-imposed handicap.

Western Research: The Building Block Method

Attempts of Western researchers to assess Soviet defense and space efforts make use of several approaches, but only U.S. Intelligence is capable of applying the so-called building block method.[6] The Soviet military establishment, with all its secrecy, is to a degree visible and observable. Therefore it is possible to catalogue the defense goods and services in physical terms: personnel, hardware, other materials. Ideally, the method yields much more than monetary aggregates, in whatever currency; it supplies a register of the Soviet defense apparatus and thus permits strategic evaluations of a more detailed character. It enables assessment of Soviet capabilities in terms of missiles or divisions or submarines and, what is even more important, in terms of specific missiles, divisions with such and such a firepower, submarines with or without certain characteristics. The catalogue lists the annually produced defense goods and services as well as goods and services in reserve, namely stocks of military hardware, provisions, and trained manpower. Whether the method provides a sufficiently correct picture of arms and the men need not be discussed in this context. Not everything is observable and there exists at any rate a gray area in R. & D. The R. & D. effort, which may constitute one-fourth to one-third of the annual Soviet defense product, is by its very nature only partly visible. For practical and methodological reasons it is measured largely by estimating inputs. Thus, even where the building block method is feasible in general, it must be supplemented by other approaches, and anybody who is not privy to classified information has

[6] Described in *Fortune* Magazine, August 1, 1969, pp. 124–125.

nothing but these other methods. They consist of detective work on data about Soviet budgets, manpower, industrial output, in particular, machine building, and on research activities, all of this combined with an evaluation of the general economic, internal, and international situations. They operate with large indeterminate residues, with analogues, and other types of assumptions and, last but not least, with visceral judgments.

Once an inventory in physical terms is assembled, it has to be priced in order to obtain monetary aggregates. This ought to be done at American and at Soviet prices. A complete list of annually produced defense and space goods and services would ideally permit a comparison with the corresponding American figures as a rough measure of overall military power, with due attention paid to readily available reserves of materiel and personnel. Such a comparison implies that equivalent values (the real value produced in the U.S. and the hypothetical value of its Soviet counterpart if the U.S.S.R. were to pay American prices) are equally "effective" here and there. But in military matters the effectiveness of preparedness measures can be ascertained only in their application; the proof of the military is in the contest. How effective Soviet or American defense expenditures would be in the dreaded eventuality of war is known only to God who is supposed to side with the heaviest battalions. Space ventures are, of course, striking while they occur; their military relevance is more difficult to evaluate than their impact on prestige.

A complete list of the U.S.S.R.'s annually produced defense and space goods at Soviet factor prices would ideally measure the resources devoted to these purposes and their opportunity cost. In reality the situation is by far more complicated. First of all, given Soviet secrecy on prices, meaningful ruble prices are known only for part of the defense bill. The rest has to be calculated by using analogous American prices, not just prices the U.S. Government pays in its own purchases but prices it would have to pay if American factories were to produce goods of Soviet specification and quality. Such prices—in dollars, of course—might do for the dollar calculation of Soviet defense purchases; their inclusion in the ruble calculation presupposes reasonable dollar-ruble purchasing equivalents—a statistical field full of traps. What is important in this context is a realization that the estimate of Soviet defense expenditures in rubles with the help of the building block method uses a large amount of dollar prices converted into rubles. In other words, the exchange rates applicable to defense and space activities enter the picture not only when a list of Soviet ruble outlays is translated into dollars; the rates are actually essential for obtaining otherwise unavailable ruble prices with the help of analogous American prices.

Adjusting Soviet Prices to Western Concepts

Insofar as Soviet prices are known, their use requires a different type of operation. Soviet price formation differs basically from the price formation on Western markets, even apart from the subsidization that may occur in defense production anywhere. Prevailing ("established") Soviet prices are converted into something approaching Western-style market prices by adding subsidies, capital charges, land

rent, and deducting Soviet-type profits and turnover taxes in a complicated procedure originally devised by Abram Bergson of Harvard University. The details need not concern us except for one aspect. If we measure the share of defense in a Soviet GNP calculated at factor cost, the degree of adjustment of the established defense prices will influence the defense total at factor cost and its share in the adjusted GNP. But the degree of adjustment varies from researcher to researcher depending on the base year used, variations of method, and assumptions for unknown magnitudes. If defense at established prices were 100 and at factor cost either close to 100 or 110 or 90, the share of defense in an adjusted GNP of 1000 would vary from 10 to 11 to 9 percent. The defense adjustment actually used differ as much. Bornstein adjusted the 1955 defense estimate of 14.46 billion new rubles downward by 13.4 percent to 12.52 billion adjusted rubles in a GNP adjusted downward by 25.3 percent.[7] Cohn, using Bornstein's base year figures in a study published in 1970, adjusted defense upwards by 8.7 percent from 11.5 to (Bornstein's) 12.5 billion rubles.[8] Bergson, with a 1955 GNP adjusted downward by 23.8 percent (in this respect there is little difference between Bergson and Bornstein) adjusted defense (published budget only) downward by a mere 1.8 percent,[9] and Becker had likewise a very slight adjustment for 1958 and 1964, namely 1.2 and 1.3 percent, except that he revised upward.[10] Cohn, in the same paper, adjusted his 1967 defense estimate (then his latest year) from 19.9 billion established rubles upward by 8.5 percent to 22 billion rubles at factor cost.[11] The question arises whether the changes in prices, taxes, profit markups, subsidies, and so on would not change the adjustment ratios between 1955 and 1967. Such ratios are quite perishable.

Deflating Soviet Prices Over Time

Not to be confused with factor cost adjustment is the deflation of Soviet prices over time. Soviet prices are fixed for a number of years, 1955 and 1967 being important bench mark years. But minor price changes occur in between. More important still, costs are changing independently of fixed price changes with the result that larger profit deductions are paid into the budget or subsidies are received from the budget. Moreover, in the course of great technological changes over a quarter of a century, new items have made their appearance giving rise to the Index Problem and its Gerschenkron effect. As new products move from high developmental to lower serial production costs, their cost prices decline, but there exists at the same time a degree of surreptitious inflation, particularly for equipment built to specification. Comparing the levels before and after the mid-1967 price revision, it appears that prices increased by an overall 10 percent, even though a

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[7] Morris Bornstein, "A Comparison of Soviet and United States National Product," *Comparisons of the United States and Soviet Economies*, Joint Economic Committee of Congress, Washington, 1959, p. 380.

[8] Stanley H. Cohn, "The Economic Burden of Soviet Defense Outlays", *Economic Performance and the Military Burden in the Soviet Union*, Joint Economic Committee, Washington, D.C., 1970, p. 184.

[9] Abram Bergson, *The Real National Income of Soviet Russian Since 1928, RAND Corp.*, Cambridge, Mass., 1961, in 1937 rubles (on pp. 301 and 303). When 1950 rubles are used, the downward revision is by 6.5 percent (p. 149).

[10] Abraham S. Becker, *Soviet National Income 1958–1964*, RAND, August 1969, Tables K–1 and K–2.

[11] *Loc. cit.*

number of machinery items were, pro forma at least, reduced in price. Since then prices appear to have crept up further. But this is a contested area, and some researchers believe that the defense price index for 1968 was lower than for 1955. Aside from materials, the military and space establishment purchases services. Here the problem is threefold. The subsistence means which the government acquires for its personnel change in costs and prices over the years. Second, and irrespective of the prevailing prices for food, clothing, shelter, etc., the remuneration in kind for everybody in the military and space establishment has gone up as Stalinist austerity gave way to modest comforts, though possibly less for the soldiers—who in the years after the war had been somewhat better off than civilians—than for the much-sought-after scientists and technicians. Finally, monetary wages and salaries have increased, both as result of price changes and changes in living condition. The productivity (or "destructivity") of personnel working in or for the country's defense has presumably risen, but in this field output is usually measured by input.

Once the Soviet defense and space effort is quantified in ruble values, the road appears free to judge the burden that such power and prestige-oriented activities impose on the Soviet people. But here a fundamental issue arises. Measuring the inputs and their economic meaning is particularly difficult in the schizoid Soviet system. It couples an ineffective civilian economy with a defense and space economy that is relatively effective because it is forcefully guided and may claim the best human and material inputs available. Thus there exists a qualitative split that adds to the burden on the population. Still this does not necessarily mean that the civilian economy would gain correspondingly from armament reduction; if transferred to civilian uses, the choice inputs are likely to lose some of their excellence.

Survey of Western Estimates of Soviet Defense Outlays

These long general considerations will facilitate a review of published estimates of Soviet defense spending. Classified information is ruled out ipso facto except when officially released (this is not a "Pentagon Paper"). Some important scholarly literature cannot be cited either because it is not yet in its final stage. Other materials refer to years and conditions that are no longer of great interest. It is fortunate that Professor Stanley H. Cohn (State University of New York at Binghamton) is publishing in this volume a study called "Economic Burden of Defense Expenditures", which carries his earlier calculations up to 1969 and which I will comment upon and compare with other estimates.

Cohn assumes that the cost of Soviet defense and space activities can be circumscribed by adding up the Ministry of Defense allocation and either the entire or half of the "science" appropriation (including R. & D. investment) from the government budget. This yields for 1969 a total of 17.7 billion plus either 5.9 or 3 billion, i.e. 26.6 or 23.7 billion current rubles (of largely 1968—post-July 1967—purchasing power). We may add that the Institute of Strategic Studies (ISS) in London implies a figure of 23 billion rubles [12] and the Stra-

[12] Institute for Strategic Studies, *The Military Balance 1970–71*, London, 1970, p. 11.

tegic Studies Center of the Stanford Research Institute (SRI) a figure of roughly 36 billion.[13]

In his paper Cohn proceeds to separate personnel and other expenditures within the Ministry of Defense budget. This he does by multiplying the estimated number of armed forces personnel (3.2 million in 1969) by the average pay and subsistence cost per person. Deducting a total pay of 3.8 billion current rubles and subsistence costs of 1.6 billion from the defense budget of 17.7 billion. Cohn arrives at 12.3 billion rubles for "non-personnel expenditures".

His personnel figures from 1960–1969 are those of the London ISS, though he changes them slightly. The ISS records a small increase from 3.15 million in 1965 to 3.3 million in 1969; in addition it lists para-military troops (uniformed Security Police, Border Guards) of 250,000 for the year 1969. (This is obviously the source of the 3.55 million men listed in an ACDA study.[14]) Cohn omits the para-military forces and gives an unchanged figure of 3.2 million men for the five years 1965–69. His 1965 figure appears high, his 1969 figure low considering the international situation during those years, particularly the Sino-Soviet tension. Furthermore, Cohn assumes unchanged subsistence costs (at 1955 prices) per man since 1950. During the 1950's and 1960's per capita consumption of the Soviet population has about doubled, and the subsistence cost of the armed forces must have also risen, though perhaps less. Thus, while there is no reason to believe that "non-personnel expenditures" were less than (17.7 minus 5.4) 12.3 billion rubles, some of the latter might have been financed out of budget funds invisible to the outside observer (the choice of sources may be left safely to Soviet accounting offices).

Before turning to the R. & D. component of Cohn's estimate, I wish to add a few comments on the development of the series over time. Cohn, using 1955 as his price base, deflates non-personnel expenditures in two ways. In alternative "A" he assumes that these expenditures are composed entirely of procurement costs and deflates them by the official Soviet heavy industry index; his alternative "B" assumes that they are composed two-thirds of procurement outlays and one-third of operations and maintenance expenditures; he deflates them by proportionately weighted heavy industry and petroleum price indices. Needless to add, even under "A", non-personnel expenditures include operations and maintenance; the difference between "A" and "B" is merely in the choice of the deflator. Deflating military cost series is quite a problem even in the U.S. with its large and well-documented price statistics; deflating Soviet series is hazardous to the utmost, even apart from some covert subsidization of military hardware prices. Cohn's non-personnel series at constant 1955 prices increases in the seven years 1963–69 by an annual average of 8.3 percent in the "A" alternative, by 5.3 percent in the "B" alternative, which is quite a range. At current prices the increase is only 4.4 percent per annum because Cohn believes in a price decline for defense goods.

[13] Statement by M. Mark Earle, Jr. and Robert W. Campbell, *A Comparison of the U.S. and USSR Economies* prepared for a symposium at Airlie House, February 8–11, 1973, sponsored by the Stanford Research Institute and the Foreign Policy Research Institute. I interpolated the above figure from 32.5 billion rubles for 1968 and 39.0 billion for 1970.

[14] U.S. Arms Control and Disarmament Agency, *World Military Expenditures 1971*, Washington, D.C., 1972, p. 35.

Western Estimates of Soviet Spending on Research and Development

As indicated, Cohn has "A" and "B" alternatives also for Soviet R. & D. expenditures. He is, of course aware that "product testing (developmental outlays)" are financed, "out of funds provided by producing enterprises". On the other hand, "not all of the budget financed scientific outlays are defense oriented. . . . The degree of this offset cannot be precisely determined." In fact, it cannot be determined with anything approaching precision either for a specific year or—with frequent changes in accounting practices—over the years. Cohn himself assumes, "A" that the entire government budget for "science" serves defense and space purposes (space ventures understood as including military and civilian applications) and, "B" that it is only "50 percent with upward rounding". Other researchers use other assumptions and thus we are faced with the following range of estimates or estimated ranges: Nancy Nimitz (RAND), 3—3.9 billion rubles in 1968, i.e. about half of all officially stated "science" outlays;[15] Cohn 2.3–5.5 billion ("A" and "B", respectively) in 1968 and 3–5.9 billion in 1969; SRI 9.3 billion in 1970;[16] William T. Lee 10–14 billion in 1970 (or 60–70 percent out of total R. & D. expenditures of 16–20 billion rubles).[17] For the year 1969—Cohn's final year—Nancy Nimitz would have a somewhat higher, SRI and William T. Lee a somewhat lower figure than just cited; even so the differences between the defense R. & D. estimates and their share in total R. & D. outlays remain glaring.

Defense as a Component of GNP

How do these various estimates of defense (and space) outlays fit into the overall picture of the economy? Here we observe less of a divergence. In Cohn's paper the share of defense in the GNP expressed in current values dips from 11.5–11.1 percent (for "A" and "B", respectively) in 1963 to 10.1–9.1 percent in 1965; then it rises to 10.4–10.1 percent in 1969. SRI has 10 percent for 1968 and 10.4 percent for 1970. For an earlier period, namely 1958–65, Abraham Becker "concluded * * * that the total military effort could not have absorbed more than about a tenth of Soviet resources during the SYP period" (SYP refers to the Seven-Year Plan).[18] This conclusion was accepted by Holland Hunter for the year 1964.[19] David E. Mark of the Department of State, speaking at Congressional Hearings in 1969, said that "Soviet defense costs, if properly calculated in ruble terms * * * turn out to be * * * about 10 percent of Soviet GNP".[20] William T. Lee arrived at a 10 percent share for a number of years in the 1960s.[21] Michael Boretsky is at an extreme with a ratio of 15.2 per-

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[15] Personal communication.
[16] *Loc. cit.*
[17] Personal communication.
[18] *Loc. cit.*, p. 267.
[19] Statement of Holland Hunter, Professor of Economics, Haverford College, in *The Military Budget and National Economic Priorities*. Hearings before the Subcommittee on Economy in Government of the Joint Economic Committee, Part 3. Washington, D.C., 1969, p. 912.
[20] Statement of David E. Mark, Deputy Director for Research, Bureau of Intelligence and Research, *ibid.*, p. 962.
[21] William T. Lee, "Calculating Soviet National Security Expenditures", Joint Economic Committee Hearings, *loc. cit.*, p. 933.

cent for 1968.[22] The ACDA paper provides a wide range of 6–10 percent uniformly for all years from 1961–71.[23] For 1971 the Peterson Report gives an estimate of 8 percent "excluding non-military space and atomic energy"; its percentage comparable to the other calculations would be slightly higher.[24] The London ISS, finally, gives a percentage of 11 percent for 1969 as well as 1970.[25]

Those researchers who agree on a defense share of about 10 percent disagree on the size of the GNP. Cohn's 1969 GNP should be in the general neighborhood of 250 billion current rubles. SRI's notation for 1968 is 324.3, for 1970 376.6 billion current rubles. Becker's 1964 figure of 202.8 billion (1964) rubles would yield an extrapolated 260–270 billion (1964) rubles for 1969 and something like 290 billion rubles of 1969 value. This is not the place for a comparative analysis of GNP estimates. The differences are statistical rather than methodological; in other words, they reflect disagreements over estimates rather than concepts, over magnitudes at established prices, over the correct adjustment to factor cost (as mentioned earlier a different adjustment rate for defense may raise its share in the GNP by plus or minus 1 percentage point) ,over price deflators, and so on.

These variations are, of course, evidence of some disagreement on the performance and, in particular, the efficiency of the Soviet economy and its defense sector. The output of military goods and services contributes to the national product and its growth but, except when available resources are better utilized, at the expense of some other sector. If the other sector is growth-promoting investment, the overall growth of the economy will tend to decline thereafter, or vice versa, disregarding an inefficient use of resources released by the military establishment. Thus the issue has two aspects: one concerns the trade-off between alternative applications of resources, the other the degree of efficiency in utilizing them here or there. Before I examine how this interrelationship has operated over time, I wish to add one further general observation.

The U.S.S.R. has a high capital-output ratio—that is, it applies not only much more manpower but also significantly more capital per unit of output than the United States and other Western-style countries. By its very nature, the GNP is gross of capital consumption allowances. In principle, it would be preferable to use net national product (NNP) statistics because they would make an allowance for the systematic capital waste in Soviet production. Such data would not only show a lower ratio of Soviet versus U.S. output but also a somewhat higher share of defense and space in the Soviet national product (possibly 1 percentage point higher). However, reliable NNP statistics are not available.

Defense Development Since the Second World War

During the Second World War defense requirements absorbed almost half of the U.S.S.R.'s national product (in 1944, according to Bergson's

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[22] Michael Boretsky, "The Technological Base of Soviet Military Power", in *Economic Performance and the Military Burden in the Soviet Union*, Joint Economic Committee, Washington, D.C., 1970, p. 226.
[23] *Loc. cit.*, p. 27.
[24] Peter G. Peterson, *The United States in the Changing World Economy*, Vol. II, Chart 6, Washington, D.C., December, 1972.
[25] ISS, *The Military Balance 1971–72*, London 1971, p. 60.

seminal research, between 40 and 44 percent of GNP at factor cost, depending on the price base).[26] Investment, largely limited to projects supporting the war effort, was reduced to 13 or 14 percent of GNP; this is why Lend-Lease supplies of capital goods were so crucial both for war and rehabilitation purposes. There followed a brief period of demobilization and reconversion, soon interrupted by growing international tension [27] and rearmament culminating in a 1952 "defense" appropriation of 10.66 billion (new) rubles. Cohn estimates that the share taken by total defense in 1950 was 11–13 percent. Since he appears to understate covert outlays for this early period (explicit science outlays were still modest even though the U.S.S.R. acquired the atomic and then the nuclear bomb) the defense share may have been one or two percentage points above the higher of his estimates for the early 1950's. The burden was severe but economic growth was nevertheless rapid in a typical postwar improvement in resource utilization.

Rehabilitation was over by the time Khrushchev was in full command. In the second half of the 1950's he maintained the overall defense and space budget on an undulating plateau, even though the armed forces were modernized and initial success was achieved in space flights. This relative stability had important consequences. For a long time Soviet machinery output operated on a seesaw principle: whenever procurement of military hardware accelerated, the growth rate of civilian machinery output and investment dropped and, within limits, *vice versa*. Investment soared in the second half of the 1950's, the Soviet national product rose rapidly, and Khrushchev, seeing the U.S. recession-plagued, predicted confidently that the U.S.S.R. would soon catch up with and overtake this country in per capita production and consumption. Concomitantly, the share of defense in GNP decreased—to something like 9 percent according to several experts in the field. Khrushchev's forecast was wrong. American growth accelerated and Soviet growth decelerated in the 1960's. The average annual growth in Soviet GNP in that decade was a little above 5 percent. While Soviet investment in fixed capital continued to increase at a faster rate than GNP—indicative of a fundamental inefficiency of Soviet investment—the lower investment rate depressed the growth rate of the entire economy. It is difficult to quantify cause and effect; the main reasons, however, appear to be the inadequacy of Soviet-type planning and management procedures combined with the seesaw effect of a new armament drive.

Since then "the general crisis has been deepening" in Soviet planning (to borrow the Marxist term usually applied to capitalism during the past century and a quarter); at least, it has become chronic, while the armament efforts fluctuated over the years. Even before Khru-

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[26] Abram Bergson, *loc. cit.*, p. 237. In the same year 1944, the U.S., with a GNP four or five times as large under the then prevailing circumstances, devoted 42 percent of its product to national defense.

[27] The general atmosphere can be characterized by a letter Bertrand Russell—of all people—wrote to Albert Einstein on November 19, 1947. It reads: "I have no hope of reasonableness in the Soviet government. I think the only hope for peace (and that a slender one) lies in frightening Russia. I favored appeasement before 1939, wrongly, as I now think; I do not want to repeat the same mistake . . . Generally, I think it useless to make any attempt whatever to conciliate Russia. The hope of achieving anything by this method seems to me 'wishful thinking'. I came to my present view of Soviet government when I went to Russia in 1920; all that has happened since has made me feel more certain that I was right." (Quotation from Ronald W. Clark, *Einstein*, New York, 1971, p. 589).

shchev was ousted, defense spending began to move sideways and this continued for a year or two under the Brezhnev-Kosygin administration, probably because some weapons programs were completed and also because the new masters wanted to appraise the political, strategic, and technological situation. But in 1966, with the desire to achieve strategic "parity", with mounting Sino-Soviet tension, and the conflicts in Vietnam and the Middle East, not to mention the occupation of Czechoslovakia, arms spending began to quicken.

Examining the decade up to 1970, i.e. the year preceding the calamitous crops in 1971 and 1972, various research efforts draw the following picture: Cohn arrives at a GNP increase in real terms of an average annual 4.9 percent from 1965–69 and a growth in defense spending of 10.1 percent ("A") and 7.3 percent ("B"). This is in line with his thesis (backed up by regression analysis) of a trade-off between defense and capital investment (my "seesaw" effect) and represents the expected reversal of an annual average GNP growth of 7 percent in 1963–65 combined with a defense growth of 1.2 percent ("A") and minus 0.5 percent ("B"). In other words, the share of defense appears to have increased between 1965 and 1969 from 9.1 to 10.1 percent of GNP. It may have dipped in the good crop year 1970 under Cohn's "B" alternative. The SRI estimate for 1965–70 ups the share of defense in the GNP from 9.1 to 10.4 percent with defense increasing in the yearly average by 11.6 percent, GNP by 8.9 percent, both in current rubles. The underlying materials assume a GNP deflator of plus 6 percent and a defense goods deflator of minus 6 percent; thus the series in real terms would move for GNP by an average of 7½ percent, for defense of close to 13 percent. These proportions pose grave problems. They deny any seesaw effect and assume that an expansion of the military establishment by three quarters of its 1965 size could have been achieved without depressing the growth of capital formation and overall output; in fact, the latter is believed to have grown amazingly fast.

If Cohn makes defense grow faster than GNP from 1960–69 and for the sub-period 1965–69—and the same is true of the SRI series from 1965–70—, it is the reverse in the ACDA statistics and the research underlying them. According to ACDA the Soviet GNP increased in the ten years 1961–70 by an annual average 8.1 percent and defense expenditures by 5.9 percent in current dollars; this adds American inflation rates to Soviet real growth, a questionable procedure. Reduced to stable values by applying the U.S. GNP deflator (which in this special case may also be applicable to defense), we arrive at an average annual GNP growth of 5.3 percent and a defense growth of only 3.1 percent. In the ACDA presentation the defense share declined in the 1960's (with fluctuations in sub-periods) not because the GNP grew improbably fast and not because the Soviets did not aim at "parity" with the U.S. and security at the frontier with China, but—presumably—because the requirements in physical terms and their costs were not thought to be as high as often assumed. The costs, in particular, would attest to the efficiency of the "industrial complex" serving the Soviet military establishment in comparison to the Soviet civilian economy. If, under these circumstances, the Soviet economy did not expand more, it was not because of insufficiency of new investment funds but because of inefficiency.

Soviet Defense Total and Defense R. & D. at Dollar Prices

Before we examine the present situation, a few words have to be added about the Soviet defense outlay expressed in dollars. The first question to be asked is: in dollar purchasing power of what year? The dollar equivalent of the Soviet GNP in, say: 1964 dollars can be converted into 1972 dollars by using the GNP deflator. It is less easy to find an adequate deflator to convert 1964 dollar data on Soviet hardware procurement or R. & D. into 1972 dollars in order to make a Soviet-American comparison for these particular outlays. In the literature on Soviet defense, one can even find dollar estimates without any reference to dollar purchasing power referred to. The other problem is to find adequate ruble-dollar ratios, except where dollar analogues underly the ruble figures or where Soviet numbers in physical terms can be transformed immediately into dollar values. For example, Soviet personnel numbers can be related to pay and subsistence costs of the American Armed Forces. It is generally agreed that more work (and expensive work!) has to be done to bring outdated ruble-dollar ratios (usually going back to 1955) up to date.

At Congressional Hearings quoted above David E. Mark of the Department of State said: "If the Soviet defense and space budget is somehow—and only imperfectly—translated into American prices, we estimate the total package of expenditures, in round numbers is $60 billion".[28] Mark's estimate reappears in the ACDA statistics (i.e. $60 billion for 1969).[29] Peter G. Peterson, as Secretary of Commerce, published in August 1972 a report *US Soviet Commercial Relationships in a New Era* with a figure of $70.2 billion for Soviet defense in 1971 as against $70.0 for the U.S.[30] A comparison of this estimate and the ACDA figure for 1969 in deflated dollars yields an average annual increase of 3.2 percent for Soviet defense spending.

The SRI estimates in current dollars for 1968 ($61.9 billion) and 1970 ($74.3 billion) are higher than ACDA's figures ($56 and $65 billion), partly because SRI includes all space outlays, while ACDA and also Peterson exclude civilian space expenditures. The figure SRI presents for 1968 is the upper limit of a range William T. Lee had calculated; Lee suggested "a current level of spending of about 52 to 62 billion dollars in 1968" (1968 dollars?).[31] To conclude with two more extreme estimates: the London ISS has for 1968 a dollar estimate of 48.2 billion and for 1971 of 55 billion (based for a number of years on the same ratio of 0.40–0.50 rubles for the dollar)[32] Michael Boretsky, referring to the year 1968, "implies a total Soviet defense budget of $84.0 billion or 15.2 percent of GNP, both valued in dollars."[33]

The dollar value of Soviet R. & D. and its military and space component was given considerable publicity by Dr. John S. Foster, Director of Defense Research and Engineering, Department of Defense, in his statements before Congressional Committees in recent years.[34]

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[28] *The Military Budget and National Economic Priorities*, *op. cit.*, p. 962.
[29] U.S. Arms Control and Disarmament Agency, *op. cit.*, p. 19.
[30] Peter G. Peterson, "U.S.-Soviet Commercial Relations in a New Era," Washington, D.C., U.S. Department of Commerce, 1972, p. 8.
[31] Cited by William R. Kintner, *The Military Budget and National Economic Priorities*, *op. cit.*, p. 933.
[32] ISS, *Strategic Survey 1972*, p. 5.
[33] *Loc. cit.*, p. 220.
[34] "On the Fiscal Year 1972 Defense RDT&E Program", Defense Subcommittee, Senate Appropriations Committee, March 24, 1971, pp. 1–3.

With a purchasing power equivalent of 1 ruble = 2 dollars, he arrived for 1970 at a total Soviet R. & D. value of 21.3 billion (1968) dollars and he estimated that 75–80 percent of this amount were devoted to military and space efforts, i.e. $16–17 billion. Given an uncertainty factor of 10–20 percent, Dr. Foster believed that in terms of 1970 spending the U.S.S.R. was at least $3 billion ahead of the U.S. On March 29, 1971 he expressed his opinions as follows:

"The Soviets are not now ahead of the United States, because past U.S. RDT&E efforts and choices of programs were adequate to achieve and maintain a lead. The average lead, approximately 2 to 3 years as of 1968, will take time for the Soviets to overcome, even with more effort than that exerted by the U.S. The crossover point in relative levels of efforts seems to have occurred in about 1968. We estimate that they could now be gaining at a rate of one-fourth to one-third of a year per year, based on apparent relative inputs. Depending on the specific mission area concerned, the U.S. lead in that area as of 1968, and the relative U.S./U.S.S.R. efforts in that area, one might expect a zero-lead condition varying from 1973 for some tactical systems to 1977 for some strategic systems. Soviet technological surprises in significant numbers might thus be expected by the middle of this decade".[35]

Congress requested the General Accounting Office (GAO) to evaluate the estimates of Dr. Foster and his group at the Defense Department. Without attempting a quantification of its own, GAO judged: "* * * extreme secretiveness by the Soviet Union results in data which are insufficient for a realistic measurement of its R. & D. efforts * * * although we believe that the DOD methodology * * * may be useful in indicating trends and the apparent magnitude of the Soviet Union military R. & D. threat, we have reservations as to its usefulness in quantifying relative efforts or spending gaps between countries".[36]

Recently SRI valued the total Soviet package of R. & D. goods and services at 27 billion 1970 dollars. It believes that 60 percent were devoted to military and space purposes; the latter effort is thus valued at $16.2 billion. SRI assumes a higher productivity of the Soviet R. & D. ruble than Dr. Foster; it applies a rate of $1.75 per ruble. Its estimate of total Soviet R. & D., valued in dollars, is higher than Dr. Foster's, its estimate of military and space R. & D. lower (particularly if price increases in the U.S. are considered). But SRI is well aware of the uncertainties of such valuations; in fact, it is presently engaged in a new effort to arrive at a better understanding of Soviet R. & D. and its value.

Some Conclusions

Before I turn to the present exigency in Soviet economic affairs, I will try to draw some conclusions from the findings summed up on the preceding pages.

Military force at rest can never be adequately judged in regard to its potential effectiveness either in support of diplomatic moves or in "continuation of politics with other means." But there seems to be a general feeling that the two superpowers are now in a state of "approximate parity." The expression "parity" is usually applied to missile launching capabilities. In economic terms we may speak of parity

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[35] "Questions and Answers Related to the Assessment of U.S./U.S.S.R. Technological Efforts", Office of the Director of Defense Research and Engineering, with Graphical Supplement, March 29, 1971, p. 19.

[36] U.S. General Accounting Office, *Comparison of Military Research and Development Expenditures of the U.S. and the Soviet Union*, July 23, 1971, *Congressional Record*, p. ES607.

when two nations produce a package of military goods and services roughly equal in value (in either prices) over a period of years. If this should continue for some time, it may be concluded that the value of their reserves in materiel and manpower will also be similar. It appears that during the 1960's the value of Soviet defense and of Soviet defense R. & D. (space included) was below U.S. levels; it may now exceed them. But the defense magnitudes available to the U.S.S.R. are only dimly perceived and their assessment in dollars poses such methodological and statistical difficulties that all one can say is: in matters of national security the two powers appear to be running nose to nose.

Using GNP as a yardstick for economic power, the Soviet-U.S. ratio appears to be less than 1:2. Since establishment of the Brezhnev administration late in 1964 the U.S.S.R. may have gained a few percentage points on the U.S. though the shift might well be statistical appearance rather than economic reality. With uncertainty about the comparative GNP and even more so about the comparative defense outlay, I hesitate to say whether the share of defense moved upward, downward, or sideways. The change was probably small, and it suffices to state that the defense burden, defined as the share of defense in the GNP, is now about the same in both countries. Expressed more meaningfully in NNP, the Soviet defense burden would probably be one one percentage point higher than in terms of GNP.

The seeming paradox that the Soviet economy, with half the American GNP (geometric average comparison) and a value of annual defense equal the American (at American prices), devotes roughly the same share of its GNP to defense and not a share twice as high, has often been brought up and just as often explained. A "paradox" of this type appears in any comparison between two countries of different economic structure but in a U.S.-Soviet comparison it is sharpened by the decidedly schizoid character of the Soviet economic system. We do not know whether in an economic sense Soviet output of defense and space goods is as efficient as American production; the record probably varies from industry to industry and may well be below U.S. standards in general (with cost overruns here and there). What counts in this context is the relative efficiency of the defense sector in comparison to the civilian economy. The defense and space sector is effective because its customers (i.e. the military) know what they want (although this does not necessarily mean that what they want is the right thing technically and strategically). The customers are also powerful enough to assure the producers a sufficient supply of managerial, scientific, and technical talent and skilled workers, as well as materials and equipment, and they watch the use of all these choice inputs with the aid of local representatives. Even with this outpouring of skilled men and expensive material, the share of defense in the GNP is as low as it is (and likewise, as Nancy Nimitz correctly stresses, the share of R. & D.) because the civilian economy and, in particular, its consumer-oriented branches are extraordinarily wasteful and, therefore, absorb a large share of the total national product.

To give an important and topical example: Soviet agriculture produces over the years about three-quarters of what U.S. farms produce (it was somewhat less in 1972!) with nine times as much labor, half again as much land, and enormous investments. True, under Stalin,

agriculture had been ruthlessly exploited. Since the advent of Khrushchev, however, and likewise under the present administration, it has received increasing attention. To appreciate what has been done and is planned for the current five-year period, one should compare the U.S.S.R. with the U.S. In 1970 $5.8 billion was invested in agriculture in this country. The capital stock at the end of 1970 was valued at $66 billion after depreciation, at $145 billion undepreciated. These figures include plant and equipment and residential building. Soviet investments in agriculture, using American prices at 1970 purchasing power, exceeded $50 billion in 1956–60 and $270 billion during the decade of the 1960s; they are scheduled to surpass (and they have up to now remained on schedule!) $260 billion during the current Five-Year Plan. (The American prices are reduced by 20 percent to discount for the lower quality of Soviet investment goods; if this discount should be on the low side, the dollar figures ought to be reduced but the disproportion would remain enormous in any case). In other words, with the current investment plans about to be reached, agriculture would in the course of twenty years have received an equivalent of close to $600 billion in capital funds (not counting investment in farm supply industries such as chemicals or in highways or central warehouses). This vast investment has been carried out in an extremely wasteful fashion, for Soviet agriculture remains underequipped compared with U.S. farms (for example, Soviet farms have by far fewer tractors, even though the tractor factories produce and deliver to agriculture by far more tractors than American factories). In 1881 Karl Marx drafted a letter to Vera Zasulich with the words: "The good harvests are balanced by famine. Instead of exporting, Russia must import grain." There is no famine now in the U.S.S.R., if only because of massive imports from the U.S. and other Western countries, but there are severe shortages and locally de facto rationing and this 27 years after the war and the large investments just mentioned. In fact, the regime cannot be said to be paying little attention to the sectors producing for consumption purposes; the problem is that the welfare effects have been meager in relation to the outlay.

As compared with its American counterpart, the Soviet economy as a whole provides a population 18 percent larger with less than half the goods and services, employing in the process 45 percent more labor and investing in real terms as much as the United States does. With such disproportionately large inputs the Soviet economy should grow at a rate approaching Japan's. In reality, the U.S.S.R.'s GNP has expanded at roughly the same pace as the United States, and a few years ago Japan was able to overtake the Soviet per capita GNP.

A second and secondary reason why the Soviet defense establishment absorbs only a moderate part of the national product is the low personnel cost. Pay and subsistence of the armed forces are far below American standards; in R. & D. activities lower living conditions of the personnel is to a degree offset by greater numbers with a lower per capita productivity. But the previously mentioned wastefulness of Soviet consumer supply has implications for the personnel cost. Given the lower living conditions, the costs are nevertheless high in terms of resource input. This refers to a calculation at factor cost. Insofar as money incomes of military and space personnel are indirectly taxed in form of high turnover tax rates, the defense budget subsidizes the general budget which, in turn, subsidizes defense.

Soviet Priorities During the 1971–72 Setback

Weather conditions in the U.S.S.R. are such that crops may be poor or good for several years in a row. When the authorities prepared the Five-Year Plan 1970–75 they could not foresee the inclement weather in 1971 and particularly 1972, but the failure of the plan was predictable irrespective of the weather. The targets were predicated on exorbitant productivity gains. Five-Year Plans are often poor as mere forecasts, and in the U.S.S.R. they are not just "indicative" but are meant to steer the economy in the absence of market prices. In reality, though they are formally laws, they are not strictly binding, certainly not on the planners themselves who are want to change their orders frequently in the course of the plan's execution but neither on the enterprise managers who are experts at evading commands or adjusting them to their capabilities and interests. What the Five-Year Plans indicate is what the leaders expect from the country—or profess to expect—at the time the Plan receives their final approval. When the current Plan was inaugurated, the leaders entertained high hopes. In fact, as late as November 24, 1971, in a speech before the Supreme Soviet, Soviet Premier Kosygin, in a Khrushchevian mood, predicted that "the general volume of the industrial and agricultural production of the U.S.S.R. in 1975 will exceed the present level of industrial and agricultural production of the U.S.".

Translated from Soviet into Western concepts, the original plan for the years 1971–75 bade the nation to expand its GNP by an average annual 6 percent.[37] Half of the growth was to be contributed by larger applications of labor and capital, the other half through gains in factor productivity. Factor inputs as a whole grew indeed as expected during the first two years of the plan. Investment even exceeded the planned targets, except that some of it came about in what the planners considered the wrong places with corresponding shortfalls elsewhere (particularly in the energy economy, in the chemical industry, and in light industries). Factor productivity, however, decreased—statistical residual that it is—as the GNP rose by only 3½ percent in 1971, by 1½ percent in 1972. The decline was the combined result of the fall in agricultural production and of a reduced growth in industrial output; even in industry factor productivity fell to almost zero in 1972. The impact on consumption was cushioned by drawing down the commodity reserves in the country (grain and other stocks) and by selling gold and going into debt abroad (indebtedness in hard currencies rose to $2.4 billion by the end of 1972 and must have increased since then). Consumption of manufactured consumer goods rose but not enough to absorb the increasing money incomes of the population. Prices moved up, openly on the limited free markets (chiefly the peasant markets), surreptitiously—through quality changes and the like—where prices are fixed.

How did the trouble in plan fulfillment affect the defense establishment? Throughout the last years the Ministry of Defense budget has remained riveted to a figure of 17.9 billion rubles. Personnel costs must have crept up, perhaps also the cost of armaments. Should we

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[37] See Douglas B. Diamond, "Principal Targets and Central Themes of the Ninth Five-Year Plan", in *Analysis of the USSR's 24th Party Congress and 9th Five-Year Plan*, edited by Norton T. Dodge, Cremona Foundation, Mechanicsville, Md. 1971, p. 48.

conclude that, as a result, expenditures for either procurement or operations and maintenance were cut to remain within the Procrustes bed of the Garbuzov budget? The official figures for total "science" increased by another 11 percent in both 1971 and 1972. Strangely enough, the "science" appropriation in the government budget has up to now been published only for 1971; it was not yet announced either for 1972 or 1973. The 1971 allocation from the budget increased by only 6 percent. If we were to apply Cohn's method to the year 1971, total defense expenditures (disregarding undetermined price changes) would have increased by either less than 2 percent (alternative "A" for "science") or less than 1 percent ("B"). Cohn's method can be followed in regard to 1972 and 1973 only if we assume (but one more assumption cannot hurt) that the ratio of "science endowment from the government and the other budgets has remained fairly stable. If this were so, the increase in total defense expenditures would be roughly 2 and 1 percent ("A" and "B", respectively) in 1972 and 2½ and 1½ percent in the present year.

If such small increases—whatever the exact percentage—were to reflect the real development in Soviet defense spending, they could be explained in three ways, which are not mutually exclusive.

First, as industry in general, armament plants failed to live up to their commitments, perhaps because they themselves did not receive supplies of materials and equipment. This, of course, would have nothing to do with the agricultural debacle; missiles are not bakery products. Delays in production can occur anywhere and anytime; nevertheless, under the Soviet priority system for armament procurement they would be kept in strict limits. The military as customers are more powerful than, say: a garment factory, not to mention individual shoppers.

Second, the government may have ordered defense plants to shift their capabilities to civilian output in order to satisfy some of the demand of the consumers and soak up their purchasing power. This explanation is at best marginal. Conversion from defense to civilian production, even on a small scale, takes time and would probably hinder plan fulfillment in industry instead of improving them. On the whole defense plants are meant to carry out carefully laid out defense programs, not to remedy the inefficiencies of the civilian economy. They have always been required to use some of their spare capacity to manufacture assorted consumer articles but they have also disliked such assignments. In this context, it is significant that the regime apparently did not mobilize troops and Army trucks on a large scale to bring in the harvest during the critical weeks of 1972; if such help was rendered, it must have been of minor importance. As is by now traditional, factories had to send out crews to the countryside; they had to interrupt their production schedule in order to ship workers, trucks, and tractors to faraway farms—with a loss in industrial output, great cost in transportation, and probably low productivity at their places of destination.

There remains as a probable explanation of a possible development, a slow growth of defense outlays scehduled in advance for the early 1970s. The political and military leadership may have felt—not without a sharp glance at the activities of rival powers—that the Soviet defense establishment, large as it is, suffices for the present after con-

siderable preparedness measures in the second half of the 1960s and that, after completing specific programs, the future course of action presupposes a reassessment. Defense economics, after all, have a business cycle of their own. Such a deceleration in procurement does not mean a pause in R. & D. activities. It is true that total "science" outlays are planned to grow by a smaller percentage in 1973 than in previous years (some 7 percent instead of the 11 percent mentioned before). But we cannot expect a doubling of R. & D. expenditures every seven years, and the billion rubles to be added in 1973 is a tidy sum. Nor do we know to what extent the official budget is supplemented by outside funds on the development side of the R. & D. effort. With few hard facts to rely upon, one may judge that purely military R. & D. activities, including related space endeavors, are expanding, that civilian space operations could have been under funding pressure—the population certainly prefers a rabbit on the plate to a robot on the moon—, and that spending on R. & D. for purely economic purposes has accelerated because of an increased awareness of the East-West technological gap outside of defense and space (possibly even in some high-priority areas).

The "Heavy Industry Priority" Syndrome

The thesis of only slow increases in Soviet preparedness spending at the present juncture—based as it is on a few untrustworthy "defense" and "science" data—cannot be proven without additional information. It cannot be disproved either by pointing to a new reversal in the output ratio of Soviet "A" and "B" industries. The issue is dear to the heart of Soviet ideologues ever since Marx constructed a tentative model of a capitalist economy able to expand lustily because capital goods output (the output of "Department I" of the economy) grows faster than consumer goods output ("Department II" including industrial *and* non-industrial production), and since Stalin made the faster growth of "A" industries (producing capital goods) in relation to "B" industries (industrial consumer goods) the ideological basis of his policy of preparedness.[38] It is a dogma dear to the heart of the men whom Khrushchev called "steel-eaters" and it led—over Khrushchev's ineffective resistence in later years of his stewardship—to a 1966 ratio of 74.4 for "A" output as against 25.6 for "B" output. The distinction does not make much sense not only because consumers are equally interested in output outside of industry but also because "A" industries are producing important inputs into "B" production. At any rate, the Brezhnev-Kosygin administration felt that a few more years of "Heavy Industry First" policy would lead to a ratio of 100:0 and that "B is worthy, I dare say, of more prosperity than A!". Thus beginning in 1967 the ratio began to reverse itself until by 1970 it had reached 73.4:26.6—a very minor change indeed.

The Five-Year Plan envisaged a further modest change of the ratio (to 73.1 : 26.9 by 1975) except in the year 1972 (A industrial growth 8.1, B growth 7.7 percent). With so many "B" industries depending on ag-

[38] *Pravda*, September 30, 1971, reported a speech by Central Committee Secretary P. N. Demichev urging the nation "to preserve the preferential growth of Department I of public production as a whole". This attempt by an important ideologue to revert from the A/B industry division to the Departments I and II of the second volume of *Das Kapital* seems to have come to nothing.

ricultural materials, the 1972 performance was reported as 6.8 percent for "A", 6 percent for "B" industries and the plan for 1973 was revised to 6.3 as against 4.5 percent for "A" and "B", respectively. In other words, "B" growth suffered but "A" growth did not fare so well either (particularly if we deflate these growth rates to more reasonable proportions). Some Western observers interpreted the performance in 1972 and the plan for 1973 as a "reordering of priorities" in favor of heavy industry. This overlooks, first, that "heavy industry" dominates Soviet industry irrespective of smallish changes in statistics. It disregards, second, that "B" industries cannot process foodstuffs and the like that the farms did not produce—except, of course, those that have been imported and the Brezhnev administration did indeed purchase four times as much grain in money terms as the Khrushchev administration after the bad crop year 1963. While Brezhnev may derive some ideological benefit from the current "A": "B" ratio, it suffices to look at the 1973 investment plan to realize that the man in control continues to worry about the attitude of the consuming masses. Investments—to be achieved, after all, with "A" products—will continue to expand on schedule in agriculture, will be maintained on a high level in residential construction, and are planned to increase by no less than 55 percent in the light and food industries (whether this praiseworthy goal will be reached is an entirely different story).

Inviolate Institutions

Severe though the changes are that the failures of the recent past have forced upon domestic plans and foreign trade, they have been made in a thoroughly conservative spirit both in regard to the existing priorities and the existing institutions. The command economy, as inherited, will remain. As the chairman of the Soviet State Price Committee, V. K. Sitnin, writing in a Czechoslovak paper reminded his readers—as though they needed a reminder—"We determinately reject any forms foreign to Marxism, any concepts of 'market socialism'. If the market does not do it, who does regulate prices then? The reply to this question is unequivocal: It is the state".[39]

The Party is, as heretofore, expected to control the economy. Politburo Member P. M. Masherov called upon the local Party functionaries to supervise the enterprises with greater "militancy" [40] (this had been called "petty tutelage" at the time of the "Kosygin Reform" of 1965). The limited delegation of investment decisions to enterprises under the 1965 reform has been largely countermanded because they catered to what is contemptuously called "local needs"; investments are recentralized. The Masherov speech is a catalogue of exhortations that occur daily in Soviet news media: bureaucrats and managers are blamed for faulty attitudes and practices; "moral incentives" and "socialist competition" are advocated; the enterprises are once again summoned to use "hidden reserves" of equipment, materials, and manpower and to complete projects already under way instead of beginning yet new ones; and the economy, finally, is urged to apply (if available) the most modern equipment, particularly computers (said Masherov: "some directors see the use of computers . . . as a conces-

[39] *Rude Pravo*, February 16, 1973.
[40] Speech reported in *Sovetskaya Belorussiya*, March 1, 1973.

sion to fashion . . . expensive equipment is used, as a rule, for the simplest of tasks and not effectively"). Such exhortations in speeches and decrees have been repeated throughout the decades; their impact, if any, was always limited in time (and sometimes, one suspects, more effective in the realm of statistics than in reality). But the Soviet leaders are dealing with acute shortfalls and may consider remedies that relieve the situation for the time being as sufficient for their immediate purposes. Basic reforms—aside from being unpalatable to the elite and therefore ideologically suspect—may actually upset ingrained habits and only add to current worries." [41]

Economic and Defense Prospects in the Near and Long Run

The defense implications of the situation as it presents itself now (another severe crop failure would complicate matters) can be summed up as follows:

1. The military leaders have probably been by and large satisfied with the supply of resources they have received in past years (disregarding the inevitable quarrels over projects on the margin), and they may realize that at this juncture they ought to be moderate in their claims in order to prevent consumer dissatisfaction from increasing and to help the economy return to more normal growth.

2. The political leaders, in turn, know that, though the military are not in control of the state, they would be most unwise to provoke them by niggardliness, if only because some would-be leader might use military displeasure to his own advantage. After all, the succession problem is as little settled today as it was in 18th century Tsarist Russia.

3. Both political and military leaders can be expected to agree that negotiations in the present phase of world politics should be conducted from a position of strength. This does not rule out concessions at the international bargaining table if they provide economies (welcome economies!) without affecting the balance of strategic power to their disadvantage.

4. The U.S.S.R. wishes to be recognized as a "global power" and must be correspondingly prepared in the years to come.[42]

5. Some day an extra effort and, with good luck, a technological breakthrough, might make Soviet power superior to its rivals.

6. Modern arms (including space) developments require long lead times. While the near future holds the prospect of protracted negotiation, the longer-term future is highly uncertain. Soviet leaders,

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[41] The recent endorsement of "production associations"—official cartels sandwiched between the branch Ministries and their enterprises—is merely another organizational regrouping which will exchange one headache for another. If Khrushchev's 1957 reform—regional councils instead of central Ministries—led to an evil called localism, the future complaint will be branchism. It will be leveled against the production associations by spokesmen of the Ministries which will feel threatened in their authority, and of the enterprise managers who will consider themselves reduced to glorified floorwalkers. (The official go-ahead for the associations is contained in a decree of the CPSU Central Committee and the USSR Council of Ministers "On Certain Measures To Further Improve the Management of Industry" reported in *Pravda*, April 3, 1973).

[42] The claim was clearly stated by Foreign Minister Gromyko in a speech before the Supreme Soviet in June 1968: "The Soviet Union is a great power situated on two continents, Europe and Asia, but the range of our country's international interests is not determined by its geographical position alone . . . The Soviet people do not plead with anybody to be allowed to have their say in the solution of any question concerning the maintenance of international peace, concerning the freedom and independence of the peoples and our country's extensive interests. This is our right, due to the Soviet Union's position as a great power. During any acute situation, however far away it appears from our country, the Soviet Union's reaction is to be expected in all capitals of the world".

whoever they are, will not wish to neglect dangers that might arise toward the end of this decade or in the 1980s, whether they present themselves in Asia, in Europe, on the high seas, or in space.

7. They may also feel that it would be unwise to impair defense (and space) industries that are on the whole well organized and have enabled the U.S.S.R. to pass from inferiority to "parity" in superpower relations.

8. A vast "military-industrial establishment" as that of the U.S.S.R. operates with a high degree of inertia in its allocational policies.

9. The Soviet defense burden is heavy but not too heavy for a great nation proud of its heritage and suffering from an invasion trauma.

10. For the time being neither the political nor the military leaders can have an interest in complicating the situation. For it is thinkable that this year's crop may again be poor (winter weather was not propitious but conditions appear to have improved since then).

In bridging the present grain gap through imports, the Brezhnev administration has been able to avail itself of an improved foreign political climate (it had contributed to its improvement) and a combination of favorable economic circumstances, namely advantageous prices for its exports of gold, platinum metals, diamonds, and fuels as well as easy credit. Interest rates appear high but are hardly sufficient to offset currency depreciations—which is another advantage for a nation going into debt in an era of inflation and devaluation. Up to now the Soviet Union has even been able to continue its purchase of and negotiations for Western equipment.

Extending our perspective to the 1970s as a whole, we may expect the Soviet economy, with good and bad chance events (such as weather fluctuations) offsetting each other, to expand its GNP annually at a rate on the low side of 5 percent per annum.[43] Factor inputs would include an annual increment in fixed capital formation of 7 percent—which would continue the practice since the 1960's. This, incidentally, would increase the share of investment in GNP to around 37 percent at present prices—an unhealthy situation which would reinforce the need for reforms. Factor input as a whole would rise at a continued rate of 3 percent per annum, and factor productivity could be expected to improve by less than 2 percent. This, in turn, means that public and private consumption could rise annually by almost 4 percent. It is obvious that if defense expenditures were to expand in line with GNP growth, personal consumption from private and public funds (the latter financing education, health care, and the like) would improve by 3½ to 4 percent; less than that if defense were to grow faster, and—what is perhaps more realistic to assume—faster if defense grows by a smaller percentage than GNP. In the second half of the 1960's—as a measure of comparison—consumption as a whole is believed to have expanded at an annual rate of above 5 percent per annum and, with a population increase of 1 percent, by above 4 percent per capita. But then, partly as the result of good crops, the GNP grew for a few years by no less than 5.6 percent per annum. In the 1970's as a whole, under this projection, personal consumption per capita can be expected to increase by 2½ to 3 percent per annum, give and take a fraction of 1 percent depending on the scope of defense outlays.

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[43] *The World's Output, op. cit.*, projects a growth of 4.8 percent on average for the 1970's as a whole.

Sudden increases of defense procurement would, of course, tend to cut into civilian investment expenditures and thus depress the GNP growth rate but they would have to be quite drastic because Soviet heavy industry and machinery industry, in particular, is by now a very large complex and no longer as sensitive to the "seesaw effect" as in previous decades. Reduced armament purchases, on the other hand, might benefit the civilian economy, but here the general efficiency problem arises: the resources thus disposable are likely to be inefficiently used. And for the same reason we must expect the military leaders, perhaps supported by political leaders, to resent any attempts to curb defense expenditures while the civilian economy is unable to live up to the standards of the "military-industrial complex", standards which are good without being extraordinary.

One should expect a country that achieves a long-run GNP growth of almost 5 percent to live happily ever after. The U.S.S.R. would, of course, not catch up with and exceed the U.S. performance (unless America falters badly) but this claim could be quietly dropped. The masses might become restive if their whetted appetites are not satisfied; this, in turn, will be affected by the ways the West will manage its own social and economic problems. But leaders and led in the Soviet Union must by now be pretty aware that with such large and ever rising inputs of capital and labor their economy should grow twice as fast as it does, were it not for its in-built inefficiency. I wish to add a few examples which highlight the previous analysis, in particular the productivity comparison between the U.S. and the U.S.S.R. and between American and Soviet agriculture.[44]

The U.S.S.R. has actually overtaken the U.S. in raw steel production. In 1972 Soviet output was 126 million metric tons, American output 121 million metric tons (or 133 million short tons). The U.S.S.R. has a very large machine building industry and invests practically as much as the U.S. (i.e., much too much; Soviet economists have claimed that less investment should induce faster growth!). On the other hand, the US.S.R. manufactured in 1972 only 730,000 passenger cars (the Fiat plant in Togliatti begun as early as 1967 is not yet fully operative) as against America's 8,823,000 cars, and another large steel consumer, container and can manufacturing, uses by far less steel in the U.S.S.R. than in the U.S. The U.S.S.R. could get along with much less steel if it would waste less in the production process and if its machinery would not suffer from overweight. Lack of quality steels is another related problem.

The Soviets have likewise overtaken the U.S. in window glass output. In 1971 the U.S.S.R. produced 237.1 million square meters or 2,552 million square feet as against 1,200.2 million square feet in the U.S. But Soviet housing construction, large though it is, was only little over half the American output. Given the climate, double windows are customary in the U.S.S.R. even in regions where they are not necessary. This would explain a window glass output roughly as large as that of the U.S. But output is twice as high. Some time ago a Soviet journal revealed that 46 percent of all window glass is smashed before or during final installation. Reason: the plan is expressed in square meters; the panes are therefore made extremely thin.[45] This ought to

[44] See pp. 195 and 196.
[45] *Stroitel'naya Gazeta*, May 16, 1971.

be a shattering experience, even if the percentage is somewhat exaggerated. Incidentally, the waste does not affect the profits of the industry, and the splinters are included in the national income.

Whether and how the Soviet people are going to solve this basic economic problem is unpredictable. They are not going to turn to a Western-style setup of private enterprises working for a moderately competitive market, supplemented by a large grant economy. Market socialism does not appear attractive either, whether the enterprises are state-owned and run by employees of the Ministries or owned by "society" and managed by directors chosen, formally at least, by workers councils. A despotic collectivism under the control of egalitarian enthusiasts would certainly fail to achieve greater efficiency. Central planning and managing with computer-made rational shadow prices is still in the realm of science fiction. I leave further ruminations about the future to my readers; it is difficult enough to guess at the actual defense expenditures of the contemporary Soviet Union.

Part III. INDUSTRY

SOVIET INDUSTRY IN THE 1971–75 PLAN

By JAMES H. NOREN *and* E. DOUGLAS WHITEHOUSE

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FIGURES

SUMMARY

The 1971–75 plan for Soviet industry is probably over-ambitious. Although an 8 percent annual growth in total industrial output is planned, the USSR will do well to match the 7.0 percent rate of growth recorded in 1966–70. In the first two years of the plan period the rate of increase has been less than 6 percent per year, and the repercussions of the 1972 harvest debacle will further diminish industrial prospects in the future.

In its emphasis on machinery and chemicals and in its reliance on productivity gains and rapid introduction of new technology, the present plan resembles previous plans. The 1971–75 published plan is much more revealing than other postwar plans with regard to the number and timing of production targets, however, and the added detail permits for the first time a reproduction of the main outline of the industrial plan. A test of the plan's consistency based on the additional information suggests that the plan's balance depends on an acceleration of material savings in certain key sectors.

Planned rates of growth of production are to be highest in machinery and chemicals (11.5 percent per year) while the targets for consumer goods, fuels and power, metals, construction materials, and forest products all fall below the 8 percent per year planned for industry as a whole. In the machinery industry,[1] goals are especially high for passenger cars, agricultural machinery, instruments, and consumer durables; the targets for chemicals provide for rapid expansion of fertilizers, plastics, manmade fibers, and synthetic rubber. Planned rates of industrial growth are almost without exception highest in 1974 and 1975. These plan goals thus rely especially heavily on the timely completion of scheduled industrial investment projects, an activity in which the USSR's performance has been particularly weak.

The industrial plan is taut because of its dependence on overly ambitious goals for material savings and technological progress. A test of the plan's consistency, performed with the help of a newly available input-output table, suggests that the scheduled production of metals, timber, and possibly electric power will be insufficient unless the USSR shows unprecedented progress in economizing on materials and power in production and in substituting more abundant materials for those in short supply.

The plan is strained in another direction. To support the projected growth of industrial production of 8 percent per year, the 1971–75 plan calls for an increase of about 4½ percent per year in the combined inputs of man-hours and fixed capital—appreciably less than the average annual increases in these inputs of 6.4 percent and 5.5 percent recorded in 1961–65 and 1966–70, respectively. Thus, factor pro-

[1] In the Soviet industrial classification, "machinery" includes all metalworking and machine building.

ductivity will have to rise by 3.7 percent per year to satisfy the plan goals, three times as rapidly as the average of the past decade.

Because the productivity goals are so high, while the possibilities of increasing labor and capital inputs more than planned are more limited than they were in previous plans, the goals for technical progress take on added importance in the 1971–75 plan. Although the technological goals depend to some extent on the acquisition of foreign technology, technical progress in the Soviet Union must be based primarily on the performance of the Soviet machinery sector. The machinery plan in fact does stress the production of technologically advanced products which will contribute to the modernization of plant and equipment throughout the economy. Nevertheless, the planned growth of producer durables—13.4 percent per year in 1971–75—is far greater than was accomplished in 1966–70 and is unlikely to be achieved. Reliance on foreign technology is most acute in the oil and gas industry, certain chemical sectors, the truck industry, and the instruments-computer sector. The USSR's sources of foreign exchange, however, are limited, and the 1972 grain purchases probably have already forced a slowdown in the planned growth of imports of western machinery and equipment.

The fortunes of three other sectors—ferrous metals, petroleum products, and chemicals—are also crucial to the fulfillment of the industrial plan. The plan for ferrous metals output seems too low overall, so any shortfall in this sector could hurt consuming sectors badly. Plans for qualitative improvements in machinery, moreover, count on a supply of ferrous metals of better quality and different mix. The USSR has not been satisfied with the progress of the ferrous metals branch and has issued a special decree devoted to accelerating technical progress in this branch. The petroleum and gas goals are important because the oil and gas sector must generate a large share of the foreign exchange necessary to pay for machinery imports. The chemical goals in turn are crucial to the success of the plans for savings on the use of metal and for boosting agricultural output (and indirectly the production of processed foods).

So far, progress toward the five-year plan goals has been mixed. The growth of total industrial production slumped in 1971 and 1972 to less than 6 percent—compared with the planned rate of 7.4 percent. The failure to fulfill plans for productivity growth was particularly serious for the 1971–75 plan strategy. In the last half of 1971, rates of growth in key sectors began to fail, and the deterioration continued in 1972. Production of processed foods was restrained by a slight decline in agricultural output in 1971, but the effect of the 1972 drought promises to be substantially greater.

Because of the tightness of the 1971–75 plan, the contrast between plans and past performance, and the rocky beginning thus far, the plan for industrial output is unlikely to be fulfilled. The growth of industrial productivity may accelerate somewhat but probably will stay closer to the rate noted in the latter part of the 1960s (1.5 percent) than to the abnormally high rates of the 1950s. Combining this rate of productivity gain with plausible increases in employment and fixed capital, a rate of industrial growth of about 6½ percent per year appears to be the most that the USSR can expect. Performance could easily fall below this rate if some key sectors falter.

Introduction

As in the past, the goals for industry are the centerpiece of the Soviet Ninth Five-Year Plan that was approved by the Supreme Soviet in November 1971. This paper reviews the overall Five-Year Plan targets for production and technology in industry and discusses the problems facing individual sectors.

The USSR has published more information on the 1971–75 Plan than on any other Five-Year Plan since 1939. The greater volume of plan data coupled with a newly available input-output table permit a more thorough analysis of the industrial plan than has been possible heretofore. Thus, the primary purpose of this paper is to test the consistency and feasibility of the plan goals. In this context, the paper represents an exploration of the anatomy of Soviet planning. Finally, the progress made toward fulfilling plan goals through 1972 will be reported, and the outlook for the remainder of the plan period will be appraised.

Soviet Five-Year Plans

The Purpose of Five-Year Plans

Soviet five-year plans set forth the leadership's major goals and priorities for the development of the economy and particularly for industrial development, which has been the primary focus of the Soviet planning process. According to one prominent Western student of Soviet planning:

> **The purpose of Soviet short-term plans is primarily to coordinate the activities of many thousands of economic units—i.e., to substitute for the market mechanism's short-term functions. In this it differs sharply from the medium- and long-term plans—five and more years in duration—whose object is to lay down the directions and time-rates of economic development.[2]**

Thus the five-year plans really are not operational from the standpoint of the individual ministry or enterprise; instead the annual plans that are adopted just before the plan year (or sometimes after the plan year has begun) assign the specific tasks to be accomplished in the following year and the inputs which each producing unit is allowed.

In the annual plans, adjustments usually are made to deal with problems and shortfalls which have occurred in the past year. These adjustments, in turn, may alter the original goals of the five-year plan. Indeed, no Soviet five-year plan attained all of its important industrial targets. Production goals have been cut, and the failure to meet productivity goals has almost always resulted in above-plan additions to the industrial labor force. Nevertheless, since the investment strategy worked out in a five-year plan affects the size and composition of production capacity over time, the five-year plan presents both general guidelines and a fairly narrow range of choices to those who fashion the annual plans.

Special Features of the 1971–75 Plan

The Ninth Five-Year Plan (1971–75) marks the first time since World War II that the Soviets have published a significant amount of

[2] Gregory Grossman, *Economic Systems*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1967, p. 83.

detail about a five-year plan. Throughout 1971 and early 1972, a stream of press and journal articles described various aspects of the plan. Then in April 1972 Gosplan released a monograph elaborating goals of the five-year plan which had been previously set out in general terms at the 24th Party Congress in April 1971 and confirmed at a Supreme Soviet meeting in November 1971.[8]

The industrial goals of the 1971–75 plan are most explicit with respect to production. The Gosplan document (hereafter referred to as the "Published Plan") specifies annual targets for the physical production of a wide range of industrial commodities and for the value of output of major industrial sectors. More than twice as many commodities are included in the Published Plan sample for 1971–75 than were included in the published plan data of the Eighth Five-Year Plan. The sample of industrial commodities included in the Published Plan for 1971–75 is broad enough to allow a detailed reconstruction of aggregate five-year plan goals for major industrial sectors—machinery, materials, and consumer goods—and most industrial branches. Therefore, for the first time it is possible to test the announced goals for output in value terms against the plan goals for physical production—in other words, to reproduce the aggregate plan.

Although no major shifts in resource allocation are evident in the Ninth Five-Year Plan, consumer-oriented production has been given more prominence in the industrial plans for 1971–75 than has been noted in previous plans. Considerable emphasis has been placed on the production of "consumer and household goods" by branches of heavy industry. In addition, machinery and equipment for the light and food industries will be among the fastest growing items of the machine building sector, and a substantial increase in industrial support to agriculture is planned.

Inspection of the 1971–75 Plan for Industry

This evaluation of the industrial plan for 1971–75 considers four questions:

- **Are the aggregate plan goals firmly based on the plans for physical production of individual industrial commodities?**
- **Do the plan goals in the aggregate and for individual sectors for the whole five-year period and for individual years seem reasonable in the light of past achievements and trends?**
- **Is the plan consistent by virtue of projecting in balanced proportions, the output of raw materials, intermediate products, and finished producer and consumer goods?**
- **Does the plan imply a plausible balance between industrial production and inputs of industrial labor and fixed capital?**

The 1971–75 plan offers a unique opportunity for dealing with these questions because the published information on the industrial sector includes a great number of goals for branch output and individual commodities that were not available when previous postwar plans appeared.

The Plan Goals for Gross Output

The major aggregate goals for industrial output are the goals for value of output (gross output) of the various branches of industry.

[8] *Gosudarstvenniy pyatiletniy plan razvitiya narodnogo khozyaystva SSSR na 1971–1975 gody*, N.K. Baibakov, (ed.), Moscow, 1972.

In the past, such goals were disclosed selectively although they were always implied by the targets for growth in the *valovaya produktsiya* (GVO) or gross output in constant prices. Gross output measures, however, have been suspect since Western analysts first began to study Soviet industry. The claimed rates of growth of gross output in industry did not seem to be supported by the announced growth in the physical production of industrial commodities.[4] In the first place, the gross output measure is misleading because it simply sums the value of output of all producing units and therefore includes much double counting of material inputs. The GVO can increase if the same quantity of output is produced under more specialized arrangements involving a greater number of enterprises. Secondly, the Soviet system of industrial management permits and encourages the pricing of new products in such a way as to increase artifically the value of gross output.

Establishing the realism of the plan goals for gross output is important because an examination of the 1971–75 plan's consistency and balance between output and inputs must be made at a more aggregated level than is possible with the plan data on physical production. The degree to which *plan* goals for gross output share the defects of the reported *actual* behavior of gross output has been a matter of dispute. The issue turns on whether Gosplan determined the targets for branch gross output by simply valuing (in some base prices) the planned physical output of a sufficiently large assortment of commodities or whether Gosplan instead projected previously claimed rates of growth of gross output with the inclusion of the biases of the conventional gross output measure. In other words, are the gross output goals rooted in the goals for physical production, or are they a prediction of what the gross output indexes will be when reported five years hence?

The 1971–75 Published Plan provides a sample of planned goals for physical production that is large enough to test the validity of most of the branch goals for gross output. The industrial commodities included in the Published Plan account for 86 percent of the value of production covered in an independent index of Soviet industrial production which has been derived from a sample of industrial commodities (the Greenslade-Robertson Index).[5] While the Published Plan's commodity coverage is weak in chemicals, nonferrous metals, and processed foods, it includes most of the Greenslade-Robertson sample of civilian machinery, a marked advantage in assessing the presence of doublecounting or new product pricing bias in the plan indicators for gross output.

The results of the test are shown in Table 1. For the branches in which the Published Plan commodity sample is broad enough to

[4] Gregory Grossman, for example, pointed out that the Central Statistical Administration reported that the 1966–70 plan for industrial gross output was fulfilled precisely although only 4 of the 37 industrial commodities for which plan and actual data for the increase in production are available showed a fulfillment of more than 100 percent. The median fulfillment, in fact, was 83 percent. "From the Eighth to the Ninth Five-Year Plan", *Analysis of the USSR's 24th Party Congress and 9th Five-Year Plan*, Norton T. Dodge, editor, Cremona Foundation, 1971.

[5] The index referred to is a modified version of the Greenslade-Robertson Index of civilian industrial production presented in this compendium. For the purposes of this paper an index of total industrial production is required. Therefore, the machinery index used in this paper is a discounted version of the official index for machinebuilding and metalworking (MBMW). Annual rates of growth were discounted by 25 percent to offset the affect of increased double counting and the bias introduced by new-product pricing. (See James Noren, "Soviet Industry Trends in Output, Inputs, and Productivity," *New Directions in the Soviet Economy*, Part II A, p. 277. Studies prepared for the Subcommittee on Foreign Economic Policy of the Joint Economic Committee, Congress of the United States. Washington, 1966.)

match or nearly match the sample underlying the Greenslade-Robertson (G–R) Index of Soviet Industrial Production, the average annual rates of growth of branch output implied by the Published Plan commodity sample are compared first, with the rates of growth measured by the G–R index in 1966–70, and then, with the published plan goals for gross output in 1971–75.

TABLE 1.—AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF INDUSTRIAL PRODUCTION IN SELECTED BRANCHES OF SOVIET INDUSTRY

Industrial branch	1966–70 (actual)			1971–75 (plan)	
	G–R sample	Published plan commodity sample	Official gross output claimed	Published plan commodity sample	Plan gross output
Electric power	7.9	7.9	9.0	7.5	7.9
Coal	1.9	1.6		2.2	3.0
Oil extraction	7.6	7.6	5.7	7.3	7.5
Gas extraction	9.2	9.2		10.1	13.5
Ferrous metals	5.5	5.1	5.7	4.9	5.1
Paper and paperboard	7.2	7.0	8.7	7.9	8.5
Construction materials	6.4	6.8	8.4	6.5	7.1
Machinery	[1] 9.4	[1] 9.0	11.7	[1] 12.1	11.4
Light industry	8.0	7.7	8.6	5.7	6.6

[1] Excludes military equipment.

Clearly, the value of the Published Plan sample reproduces the G–R index for several industrial branches, while at the same time it agrees surprisingly well with the plan targets for branch gross output in 1971–75. The plan goals for these branches therefore appear to be based firmly on a broad range of commodity goals and can thus be used in further analysis.

The comparison of growth rates in the machinery sector is a special case. In 1966–70, the index based on the G–R civilian machinery sample agreed very well with that compiled from the Published Plan sample; in fact, the contents of the two samples are almost identical.[6] The Published Plan sample of consumer durables, however, cannot be used in comparisons with the planned growth of gross output of machinery in 1971–75 because plans for the sample items such as television sets, refrigerators, and washing machines are given only in terms of gross numbers and do not reflect the substantial upgrading in the model size and complexity of these durables which is to take place during the five-year plan.

A substitute plan index for consumer durables can be fashioned from the official goals for value of output of *tovary kul'turnogo naznacheniya i khozyaustvenny obikhoda*, a catchall category including most household durables. Between 1950 and 1970 the machinery component of this category grew at rates close to, but generally somewhat below the rates of growth of a consumer durables sample based on the reported production of major durables. In contrast, in 1971–75,

[6] Civilian machinery includes all machinery except classes of machinery intended solely for military-space use. Thus passenger cars and trucks delivered to the armed forces are counted in the sample of civilian machinery, but combat vehicles are not. The main items of machine building included in the G–R estimates but not found in the Published Plan sample include civilian shipbuilding, and some railway machine building. These items, together with some minor machinery products of other branches also excluded from the Published Plan sample, accounted for 11.1 percent of the total G–R machinery sample in 1970. The missing machinery products collectively grew somewhat slower than total machinery production in 1966–70 and will probably continue to do so in 1971–75, but this should have only a minor effect on overall machinery growth in 1971–75.

the machinery component of the *tovary* category is scheduled to increase by between 80 percent and 90 percent, while the Published Plan sample of consumer durables (which contains the same items as the sample alluded to above) grows by only 30 percent. This paper takes the view that the official series on household durables (the *Tovary* series) suitably adjusted, does reflect the real growth planned for consumer durables produced in the machinery sector. When combined with the Published Plan sample of producer durables, an implied growth in civilian machinery of 13.4 percent per year results, compared with the planned increase of gross output of machine building and metal working (MBMW) of 11.4 percent per year. The difference in these rates of growth is probably due to the inclusion of military hardware—a slower growing component of MBMW gross output. Thus the official goal for gross output in MBMW appears to represent planned physical production and can be treated like the goals for other branches in subsequent analysis.

Plan Goals for Industry in Perspective

The 1971–75 goals for the major sectors of industry imply a pick-up in the rate of growth of industrial production as a whole as well as in some of the major branches—notably machinery, forest products, paper and paperboard, coal products, and processed foods (see Table 2). The picture is somewhat different, however, in most branches producing industrial materials and in light industry. The growth of electric power production, which declined considerably in the latter half of the 1960s, will continue at about the same rate as during 1966–70. Petroleum products and gas are scheduled to follow this same trend, while the planned growth of ferrous and nonferrous metals will be somewhat lower than the rates achieved in 1961–65 and 1966–70. The planned growth rates of construction materials and chemicals—while above the 1966–70 rates—represent only a partial return to the rates of growth recorded in 1961–65. Similarly, the planned growth of the food industry is not as high as the growth in 1961–65 but is much higher than the rate achieved in 1966–70.

TABLE 2.—USSR: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF INDUSTRIAL PRODUCTION, 1966-70 AND 1971-75 PLAN

	Greenslade-Robertson indexes[1]		1971–75 (plan)
	1961–65	1966–70	
Industrial materials	7.3	6.1	7.0
Electric power	11.5	7.9	7.9
Coal products	2.7	1.9	3.0
Petroleum products and gas	10.9	7.9	[3] 7.9
Ferrous metals	7.9	5.5	5.1
Nonferrous metals	8.4	8.6	8.4
Forest products	3.0	3.5	[3] 5.8
Paper and paperboard	7.7	7.2	8.5
Construction materials	8.0	6.4	7.1
Chemicals	11.7	9.3	11.5
Machinery	9.3	8.8	11.4
Light industry	2.4	8.0	6.6
Food industry	7.0	4.7	6.2
Total industrial output	7.2	7.0	8.0

[1] See Table or. p. 280, of this compendium for the indexes of all sectors except the machinery sector. The index of growth for the machinery sector, as explained above, reflects the annual rates of growth of GVO in MBMW, discounted by 25 percent.
[2] All data based on gross output goals unless otherwise indicated.
[3] Based on the commodity sample in the Published Plan.

The major part of the planned increase in the growth of industrial production in 1971–75 is due to the scheduled acceleration in machinery production. Machinery output has always increased faster than industrial output as a whole; changes in the relative shares of the three major industrial sectors in value added in industry show what has occurred:

	Percentage shares of value-added in industry			
	1960	1965	1970	1975 plan
Industrial materials	51	51	49	46
Machinery	26	29	31	36
Consumer nondurables (light and food industries)	23	20	20	18

Although the share of consumer nondurables in total production has been decreasing and will continue to decline in 1971–75, some of the planned growth in machinery production (consumer durables, agricultural equipment, and equipment for the light and food industries), if attained, will result ultimately in a greater supply of consumer goods. Nevertheless, the structural shift in favor of the machinery sector implied by the 1971–75 Plan is twice as rapid as in preceding 5 year periods. The basis for this discontinuity with past trends will be examined in a following section.

Timing of Planned Production

The listing of annual goals for most branches of industry and for many industrial commodities is a novel feature of the new five-year plan. Almost without exception, the planned rates of growth for the industrial branches as well as for key industrial commodities are highest in the last two years of the plan.[7] This pattern stands out particularly in the annual plans for major industrial materials, as shown below:

	Annual percentage growth				
	1971	1972	1973	1974	1975
Crude steel	3.5	4.7	4.3	5.5	6.0
Coal	−0.6	2.2	2.8	2.9	3.7
Petroleum	6.5	6.4	8.6	7.5	7.6
Natural gas	6.6	8.5	9.2	12.0	14.3
Electric power	6.6	7.6	7.4	7.9	8.1
Chemicals and petrochemicals	8.1	10.5	10.7	13.6	14.5
Cement	5.0	4.4	4.9	7.2	7.5
Paper	4.9	4.5	6.6	6.6	7.5

The abrupt acceleration in production in 1974–75 is probably tied to the expected completion of major investment projects. By scheduling most of the acceleration in the later part of the plan period, Gosplan and the Soviet leadership are taking a major risk because

[7] The annual goals are presented in full in Appendix B.

the Soviet record in completing construction projects on time is notoriously bad.[8]

The planned rise in annual growth rates over the plan period is not based on experience in the 1959–65 or 1966–70 plans, as indicated in Table 3. In these plan periods, an acceleration in growth rates during the early years of the plan was generally followed by a decline in the pace of growth in the final years of the plan. There is an underlying logic in this kind of historical development of production. In the early years of the plan period, the enthusiasm for the plan coupled with the necessity to count carefully on the production capacity that exists or that is just coming on stream supports the rate of growth of output. Also, a systematic lag in construction leads to the bunching of completed projects at the end of the plan period, which, in turn, leads to increased production in the early years of the next plan. Later in the plan period, any errors in scheduling the assortment of production or the availability of new capacity tend to accumulate and depress actual growth below planned levels.

TABLE 3.—USSR: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF INDUSTRIAL PRODUCTION IN 1959–70[1]

	Seven-year plan		Eighth five-year plan	
	1959–63	1964–65	1966–68	1969–70
Ferrous metals	8.4	8.1	6.3	4.3
Nonferrous metals	8.8	8.0	9.6	7.0
Electric power	12.1	10.6	8.0	7.8
Coal	2.1	4.2	1.6	2.5
Petroleum products and natural gas	12.9	8.9	8.4	7.2
Forest products	3.9	3.0	3.3	3.8
Paper and paperboard	5.5	10.1	7.9	6.2
Construction materials	11.5	7.8	7.1	5.4
Chemicals	9.7	13.3	9.7	8.7
Machinery	11.0	7.1	9.0	8.6
Light industry	4.6	1.5	8.7	7.0
Food industry	6.4	8.1	4.7	4.7
Total industrial output	8.0	6.8	7.0	6.3

[1] G–R index of industrial production, modified by the use of a discounted index of GVO of the MBMW sector (see p. 212).

Consistency and Feasibility of Plans for Output and Material Inputs[9]

The more plentiful provision of detailed plan data in the Published Plan allows a test of the consistency and feasibility of the 1971–75 Plan with respect to basic industrial materials. Planners strive for a balanced plan in the sense that the multitude of individual goals for production of raw materials and semi-finished products are consistent with the goals for the output of finished products—the basic require-

[8] Already, in this plan period, the inventory of unfinished construction projects has lengthened with unexpected speed—by 10.3 percent in 1971 and by more than 6 percent in 1972. The 1971–75 plan directives set a target of limiting the total increase in unfinished construction to 15 percent over the five years of the plan.

[9] The authors are grateful to Kurt Kruger for correcting our initial attempts to measure technological change and for designing the method of transforming the 1966 coefficient matrix to provide 1970 and 1975 matrices which incorporate the technology change and are consistent with final demand and gross output estimates. In addition we would also like to thank John Pitzer for programming the model and calculating both the measure of technological change and the projected coefficient matrices.

ment for coordination of production in any country. A test of the *consistency* of the Published Plan is a test of the plan as it stands. It asks the question: would the plan be in balance if all the production targets are met and all the goals for changes in input coefficients are realized? The *feasibility* of the plans for production and materials savings is a separate question. This second question considers whether the plan, even if balanced on paper, is unrealistic because it (a) requires too much of an increase in the output of a particular sector, (b) depends too much on economies in the use of raw material inputs or (c) assumes too rapid a substitution of one input for another in production. First, the consistency of the Plan and then its feasibility will be examined with the help of a 23-sector Soviet input-output (I–O) table.

In devising a consistent plan, the Gosplan technicians have the difficult job of predicting what the relationships will be between inputs and output from 1 to 5 years hence. The ratios between inputs and output in a given sector change continuously as methods of economizing on the use of a particular raw material or semi-finished product are introduced (material savings). These ratios (or input coefficients) may fall as a given input is replaced in production by other materials (e.g., steel by plastics) or, alternatively, rise as a particular input is substituted for other inputs (e.g., if oil is substituted for coal as a fuel). The consistency test of the 1971–75 plan accepts the goals for changes in input coefficients insofar as these are available; otherwise, input coefficients are assumed to change in 1971–75 in the same direction and at the same rate as they did between 1966 and 1970. The consistency test used in this paper combines these input coefficients predicted for 1975 with the sectoral production planned for 1975 to estimate what is left over from each sector's production after the requirements levied by other sectors are satisfied. The I–O analysis thus tests whether the planned production of each industrial sector will be too little or too much, both to supply other producing sectors and to provide a reasonable volume of output to the end uses of GNP—consumption, investment, defense, and exports.[10]

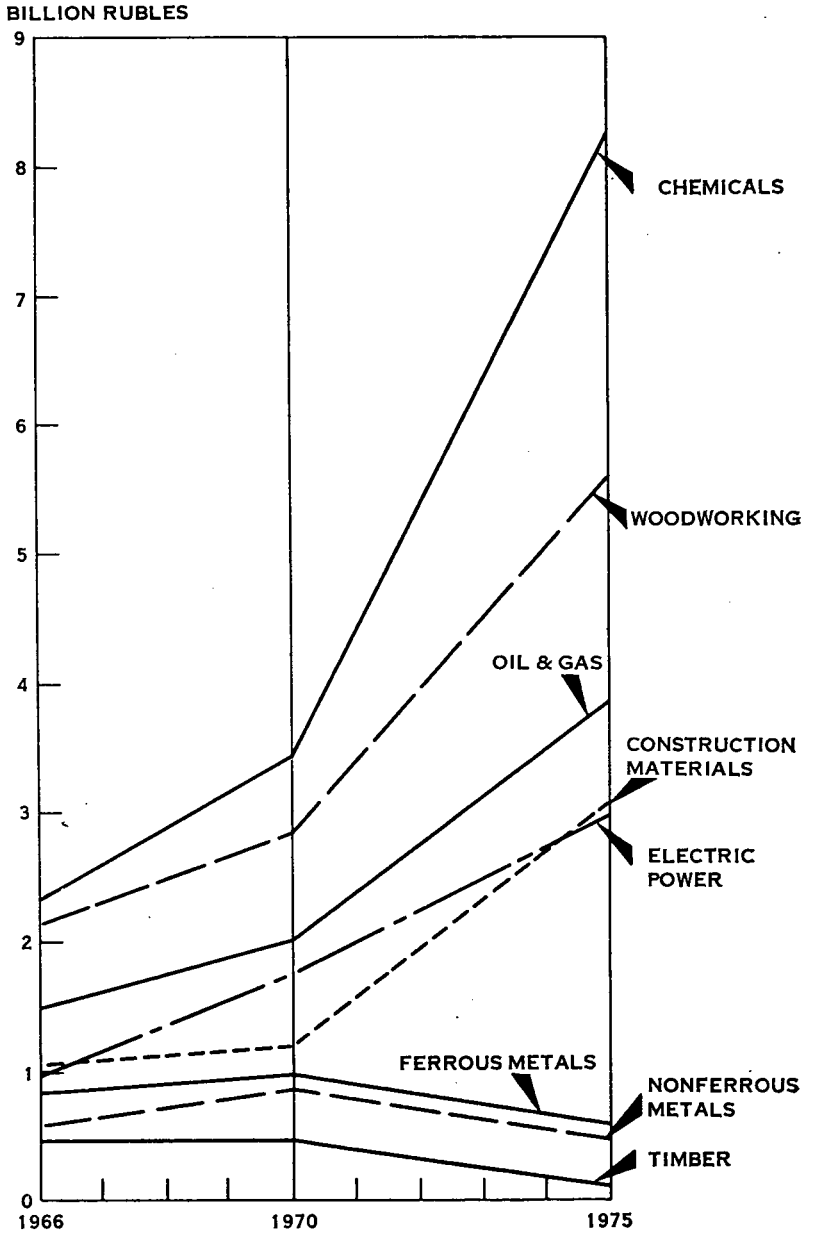
The results of the consistency test are presented in Figure 1.[11] The figure shows for 1966 and 1970 the output that industrial branches producing industrial materials did in fact deliver to final demand—i.e., to personal and public consumption or for purposes of investment, defense, or export. The values for 1975 show the output that these same branches would be able to deliver to final demand after satisfying the requirements for inputs of raw materials, fuel, and power implied by the five-year plan goals for all producing sectors. These interindustry requirements, in turn, assume that the five-year plan targets for changes in input coefficients will be met. A fuller explanation of this test is given in Appendix A.

[10] The Soviet I–O table is limited to material product, and, therefore, does not include services as a component of GNP.

[11] The I–O test is necessarily an indirect test because the Published Plan gives targets for sector gross output but not for deliveries to final demand by sector or origin. If the plan for deliveries to final demand by sector of origin were available, the I–O coefficients (projected to 1975) could be used to calculate the sector gross outputs required to produce the planned GNP. Then, these calculated gross outputs could be compared directly with the sector gross outputs reported in the Published Plan—a test of consistency more straightforward than the procedure that this paper is obliged to employ.

FIGURE 1

Basic Materials Available for Consumption, Investment, Defense, and Exports



In brief, the consistency test reveals possible discrepancies. Apparently, the plan calls for enough electric power, but not enough ferrous metals, nonferrous metals, or timber to go around. On the other hand, the planned production of chemicals, fuels, processed wood products, and construction materials seem to be greater than necessary. Electric power is an example of an industry whose deliveries to the end uses of GNP is just in balance if plans for changes in input coefficients are fulfilled. According to the 1971–75 plan, deliveries of electric power to the population and to government are to rise by 67 percent by 1975. The I–O consistency test indicates that the electric power available for such uses will increase by 69 percent.

It is not clear why planned production of ferrous metals, nonferrous metals, and timber seems to fall short of the probable demand. Supply and uses are balanced only if exports, additions to stocks, and—in the case of ferrous metals—consumer purchases of metal hardware and utensils are assumed to fall sharply between 1970 and 1975. There seems to be no basis for such a projection. A reasonable projection to 1975 of the population's requirements for metal articles and firewood and the probable need for exports and inventories suggests that:

(1) The planned output of ferrous metals is at least 0.5 billion rubles too low (3 percent of total 1975 gross output),

(2) The planned output of nonferous metals is almost 0.7 billion rubles too low (5 percent of total 1975 gross output), and

(3) The planned output of timber is at least 0.4 billion rubles too low (10 percent of total 1975 gross output).

Part of the apparent discrepancy may be the result of error in the I–O tables used in the consistency test, and some of it may be caused by the lack of complete information on planned changes in input coefficients between 1970 and 1975. It is worth noticing, however, that the coefficients for which information is not available would have to decline from two to seven times more rapidly than they have in the past to make consistent the goals for ferrous metals, nonferrous metals, and timber.[12]

In those sectors where the planned production in 1975 seems to be greater than demand, the apparent surpluses can be justified for the most part. The planned exports and domestic use of petroleum and natural gas could be high enough to explain the sharp rise in deliveries to the end uses of GNP that is shown for fuels in Figure 1. Indeed, sales of these products abroad will have to finance a substantial share of hard currency imports. Most of the increase in deliveries of woodworking output to GNP end uses probably originates in a planned increase of 65 percent in the manufacture of furniture. In the case of construction materials, planned substitution of such products as concrete panels and reinforced concrete for steel and lumber in construction could accelerate in 1971–75, and exports of construction materials will rise. Still, interindustry demand and exports are not

[12] The test used the following average reductions in the relative interindustry use of ferrous metals, nonferrous metals, and timber (except for the reductions specifically cited in the Published Plan): ferrous metals—6.5 percent; nonferrous metals—1.2 percent; and timber—6.1 percent. These assumed reductions were based on how the coefficients changed between 1966 and 1970. To restore consistency to the plan, the coefficients for ferrous metals would have to decline by 13 percent, the coefficients for nonferrous metals by 6 percent, and the coefficients for timber by 45 percent.

likely to grow enough to bring planned production and uses of building materials into balance. Part of the discrepancy between the planned production and apparent uses of chemicals in 1975 may well be the result of an upsurge in the planned production of household chemicals and an undisclosed intent to push chemical exports in 1971–75. The chemicals plan would also be more in balance if industry manages to substitute chemical products for other inputs at a faster rate in 1971–75 than in the past.

A test of the feasibility of the 1971–75 plan for industry confirms the weaknesses of the plan that were uncovered by the consistency test and suggests that electric power may also be a problem sector. The feasibility test simply substitutes the trend in input coefficients recorded in 1967–70 for the changes specified in the Published Plan. Judged by the 1967–70 experience, the goals for economizing on ferrous metals and electric power appear implausibly high. The 1975 goal for output of electric power, which was adequate according to the consistency test, seems too low when a continuation of past trends in electric power coefficients is assumed instead of the planned reduction of 7.2 percent per year in every sector. The supply and demand for petroleum, chemicals, and timber on the other hand is in better balance when input coefficients change at the 1967–70 pace instead of at the rate set out in the Published Plan. The output available for delivery to the end uses of GNP in 1975 in the two tests is as follows (in million rubles):

OUTPUT AVAILABLE FOR DELIVERY TO FINAL DEMAND, 1975

	With planned changes in input coefficients (consistency test)	With past trends in input coefficients (feasibility test)
Ferrous metals	698	−267
Fuels	4,350	3,954
Electric power	2,986	2,634
Chemicals	10,511	7,495
Timber	106	322

Thus, the I–O test of the 1971–75 plan for industry suggests that the production of ferrous and nonferrous metals and, to a lesser extent, timber will prove to be a bottleneck in achieving the plan goals. To overcome this bottleneck, the USSR will have to substitute other materials such as plastics for metals at a greater rate than presently planned or achieve a breakthrough in reducing losses of metal in industry and at construction sites.[13] The target for electric power also seems too low to satisfy all consumers, but the planners have a safety valve in this sector. They can trim deliveries of power to the population to ensure an adequate supply for producing sectors.

The 1971–75 plan for industry then is a taut plan in the tradition of all Soviet plans. In the past, inconsistencies between the production of raw materials and semi-finished and finished goods have been re-

[13] The 1971–75 Plan indicates a goal for an 18.6 percent reduction in the value of ferrous metals used in producing each ruble of machine-building and metal-working output and a 10 percent reduction in the value of ferrous metals embodied in each ruble of construction output. In the 1966–70 Plan, Gosplan projected reductions from 20 percent to 35 percent in ferrous metals coefficients, but only a 6 percent average reduction was achieved.

solved by scaling down goals for output of finished goods—particularly machinery, chemicals, and construction projects. The 1971–75 plan could well develop along similar lines. The machinery plan seems especially vulnerable because it calls for such a pronounced acceleration in the growth of production. On the one hand, if not enough metal is produced, production targets for machinery will have to be cut back. On the other hand, the USSR probably could not meet the goals for producing machinery in the 1971–75 Plan even if there were an ample supply of metal—partly because of its longstanding problems in introducing new models of machinery. To the extent machinery production goals are not fulfilled, the tension in the plans for output of ferrous and nonferrous metals as well as electric power will diminish.

Plans for Productivity of Labor and Capital

The most doubtful aspect of the industrial plan is that the planned acceleration in production is to be supported by a smaller increase in industrial employment and a slower rate of growth of industrial fixed capital stock than in the past. In 1966–70, industrial employment increased by 2.9 percent per year; the planned rate of increase in 1971–75 is 1.3 percent per year. Premier Kosygin and other commentators on the Five-Year Plan explained that an overall slowdown of the expansion of the labor force and a desire to funnel more workers into the service sector lent special importance to the plan for labor productivity in industry.[14] At the same time the growth of new plant and equipment in industry is not scheduled to accelerate. Although industrial new fixed investment is planned to grow somewhat faster in 1971–75 (8.6 percent) than in 1966–70 (7.8 percent), this investment will support a planned growth of industrial fixed capital stock somewhat less than that achieved in 1966–70 (8.4 percent per year in 1971–75 compared with 8.7 percent in 1966–70).

Just how ambitious the plans for industrial productivity are can be seen in Table 4, which compares past trends in output, inputs, and factor productivity.[15] The implied growth of combined factor productivity in 1971–75, 3.7 percent annually, seems unrealistic in light of the very low growth rates achieved during the 1960s. The goal for industrial production, discussed earlier, calls for a partial return to the rates of growth of the 1950s, after a pronounced slump in the 1960s. Virtually all of the decline in the average annual growth of industrial output in the 1960s can be traced to an abrupt slowdown in the growth of productivity of inputs of labor and capital. Although the rate of increase of fixed capital available to industry fell somewhat in the 1960s compared with the very high levels of the 1950s, this was offset by a substantially higher rate of growth of man-hours worked in industry, as the scheduled reduction in the length of the workweek had run its course by 1961.

The very ambitious target for productivity growth in 1971–75 is not a new feature of Soviet plan goals. Following the decline in the

[14] A. N. Kosygin, *Directivy XXIV s'ezda KPSS po pyatiletnemu planu razvitiya narodnogo khozyaystva SSSR na 1971–1975 gody*, Moscow, 1971, p. 23 ff.

[15] The growth in factor productivity represents the growth in output per combined unit of labor and capital services.

growth of productivity of labor and capital in the early sixties—which was instrumental in convincing the Soviet leadership to introduce the 1965 economic reform—the plan for 1966–70 called for average annual increases of 3.9 percent in productivity and 4.1 percent in combined inputs of labor and capital to support an 8.2 percent planned annual increase in production. The expected surge in productivity did not materialize, however, so the basis for continued optimism regarding productivity gains is not known.

TABLE 4.—USSR: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF INDUSTRIAL PRODUCTION, FACTOR INPUTS, AND FACTOR PRODUCTIVITY

	1951–60	1961–65	1966–70	1971–75 (plan)
Industrial production	9.9	7.2	7.0	8.0
Inputs:				
Labor inputs:				
Man-hours	2.4	3.0	3.3	1.3
Employment	4.0	3.9	2.9	1.3
Capital inputs	11.5	11.2	8.7	8.4
Total inputs: [1]				
Man-hours and capital	5.8	6.3	5.5	4.3
Employment and capital	7.1	6.9	5.3	4.3
Productivity:				
Labor productivity:				
Man-hours	8.0	4.1	3.6	6.7
Employment	5.7	3.2	4.0	6.7
Capital productivity	−1.4	−3.6	−1.6	−0.4
Factor productivity: [1]				
Labor measured in man-hours	4.1	0.8	1.5	3.7
Labor measured by employment	2.8	0.3	1.7	3.7

[1] Inputs of labor and capital are combined using weights of 58.4 and 41.6 percent, respectively, in a Cobb-Douglas production function. The weights represent the share in value-added in industry in 1968 of wages and social insurance deductions on the one hand and depreciation charges and an imputed 12 percent charge on fixed and working capital on the other hand.

The slight improvement in most of the productivity indicators in the last half of the 1960s was hardly sufficient to account for Gosplan's boldness in projecting productivity in the 1971–75 plan. Moreover, little was heard of the economic reform at the 1971 party congress and Supreme Soviet meetings; instead the need to speed up the assimilation of new technology was the dominant theme. The plan for industry deals with this question in the sections dealing with the production of new products and investment in industry. Many of the technological goals, however, seem to be mainly a restatement of previous goals and do not promise new breakthroughs that would support the planned upsurge in productivity.

In this connection, the role of the economic reform has been soft peddled to the vanishing point. Both the plan directives and the speeches at the Supreme Soviet meeting in November 1971 appeared to back away from the intent of the 1965 reform—to give enterprise managers more freedom and workers more incentive. Meanwhile, the emphasis was placed on more detailed analysis of enterprise operations (i. e., more, rather than fewer, direct success criteria) and on intensifying the role of the party in the direct management of the ministerial organizations. Based on past performance, however, reliance on tighter control by the party and on moral rather than material incentives is unlikely to bring about substantial increases in efficiency at the lower administrative echelons and producing units. Indeed, the leadership by early 1973 had decided that a more fundamental change in indus-

trial management should be introduced on a massive scale—the production association.[16]

In the past, shortfalls in attaining productivity goals were partly offset by higher than planned increments to industrial employment—achieved mainly by increasing the labor participation rate and drawing labor into industry from other sectors of the economy, especially agriculture. Thus, industrial employment, which was originally slated to increase by less than 2.5 percent per year in 1966–70, actually grew at an average annual rate of 2.9 percent. In this five-year plan, a slower rate of increase in the labor force limits the options open to the planers. The population of working age during the plan is already known, and the chances of increasing the participation rate are slim. At the same time the emphasis placed on agriculture and especially the livestock sector has reduced the flow of labor from the countryside.

If the productivity plans for 1971–75 are not met, the leadership will have to draw additional labor from the increment currently planned for other sectors—notably services—or accept lower rates of growth of output. Substitution of capital for labor will not be a viable alternative. The planned growth of capital stock was underfulfilled in 1966–70, and fixed capital in industry is not likely to grow more rapidly than planned in 1971–75. Despite the professed intent of the leadership to stress the service sector in 1971–75, it is unlikely that they will permit serious shortfalls in industrial production in order to hold to the plans for services; indeed, increments of labor currently planned for the service sector are explicitly related to gains in productivity.

In addition to increasing industrial employment directly, inputs of industrial labor could be increased by greater use of "voluntary" overtime. On the extra-legal "Black Saturdays" employees devote additional time to their jobs without pay.[17] The "Subbotnik" represents another means of increasing the number of man-hours worked in industry. Under this regime, masses of workers volunteer to work on a few Saturdays at jobs not connected with their regular employment. These kinds of semi-compulsory overtime, however, probably cannot be used year after year without affecting workers' morale and productivity unduly.

Thus, neither past trends in productivity growth nor the present plans for technological gains, management reform, or improved worker incentives appear to warrant the exceptionally high rate of growth of productivity planned through 1975. Although the growth of productivity may accelerate somewhat, it is more likely to remain closer to the rate noted in the latter part of the 1960s (1.5 percent) than to return to the abnormally high rates achieved in the 1950s. Since the limits to increasing industrial employment are more stringent than in the past, efforts to augment the industrial labor force will probably not result in a growth of man-hours of labor higher than 2 percent to 2½ percent per year during 1971–75.

Such rates of increase in factor productivity and man-hours together with the planned growth of industrial new fixed capital stock, would yield a range of industrial growth of from 6.5 percent to 7.0 percent

[16] See p. 236 for a discussion of this development in industrial administration.

[17] The extent to which this concept is employed varies from city to city. In Leningrad, for example, 8 Black Saturdays were scheduled in 1972.

per year—below the planned growth of 8.0 percent per year but consistent with past trends in Soviet industrial production.[18] Indeed, the USSR will do well to match the 7.0 percent rate of growth recorded in 1966–70, and even this rate may be out of reach in light of the current failures in the agricultural sector.

Regional Aspects of the Plan

The regional data in the 1971–75 plan indicate that the geographic incidence of industrial development will remain relatively unchanged. Industrial development in the Central Asian republics and the economic regions east of the Urals will continue to focus primarily on the extraction and processing of natural resources, particularly fuels and nonferrous metals, while development in the European regions and republics will concentrate chiefly on increasing manufacturing capacity. According to the Soviet press, about one-third of the major new construction projects of the industrial and construction ministries will be located in the eastern regions defined as Siberia, the Far East, Kazakhstan, and the Central Asian republics.[19] The planned growth of industrial production in the 15 republics is presented in Table 5. The most rapid growth is scheduled for Armenia, Turkmenia, Moldavia, and Kazakhstan, followed by Belorussia, Kirgizia, Uzbekistan, and Lithuania. Azerbaydzhan and the RSFSR are slated to grow at about the same rate as the national average. Georgia, the Ukraine, and Latvia follow, and the slowest growth is planned for Estonia and Tadzhikistan.

Both the planned growth of industrial production shown in Table 5 and the plans for fixed investment suggest that the very large present regional differences in per capita industrial output probably will continue to increase during 1971–75. Regional gaps in per capita industrial production increased considerably under a 1966–70 plan which was quite similar to the 1971–75 plan. In most instances, the failure to achieve planned rates of growth of industrial output was greatest in the Transcaucasian and Central Asian republics, where rates of population growth are also considerably above the national average.

Because of the squeeze on available resources, the leadership insists that most of the industrial growth in all republics must be achieved through increases in productivity rather than by large increments in labor or fixed capital. Plan data reflect this strategy in that investment per capita in most of the minority national republics is to grow somewhat slower than in 1966–70 or, at best, maintain the same rate of growth. Only in Azerbaydzhan is the 1971–75 planned increased in per capita investment significantly greater than that achieved during 1966–70. Scheduled cutbacks in the rate of growth of investment are especially steep in Lithuania, Belorussia, Armenia, and the Uzbek republic.

Based on past experience, there is little reason to believe that factor productivity will grow significantly faster in the less developed than

[18] The figures for growth of output assume a 1.5 percent to 2.0 percent average annual increase in factor productivity and a 2.0 to 2.5 percent average annual increase in labor inputs. The weights used to aggregate labor and capital inputs were the same as appear in the note to Table 4.

[19] Since these figures are stated in terms of cost, they may actually overstate the extent of scheduled new facilities in the East because construction costs generally are greater there than in the European regions of the country.

TABLE 5.—USSR: REPUBLIC GROWTH IN INDUSTRIAL OUTPUT AND FIXED INVESTMENT

Republic	Indexes of industrial output				Percentage increase in per capita new fixed investment (compared with preceding 5 years)			
	1970 [1]		Plan 1975 [2]		Actual		Plan	
	1965=100	Rank	1950=100	Rank	[3] 1966–70	Rank	[4] 1971–75	Rank
Armenia	172	4	164	1	37	7	16	14
Turkmenia	150	10	164	2	37	8	32	9
Moldavia	157	6	162	3	46	3	48	1
Kazakhstan	156	7	159	4	12	15	10	15
Belorussia	179	2	158	5	62	1	45	2
Kirgizia	184	1	155	6	31	11	31	11
Uzbekstan	136	15	151	7	46	4	22	13
Lithuania	174	3	149	8	60	2	33	8
RSFSR	149	13	147	9	32	10	37	3
Azerbaydzhan	137	14	146	10	15	14	35	7
Georgia	153	8	144	11	41	5	36	5
Ukraine	150	11	143	12	29	12	31	10
Latvia	157	5	140	13	38	6	36	4
Tadzhikistan	150	12	138	14	19	13	25	12
Estonia	151	9	138	15	35	9	35	6
U.S.S.R.	150		147		31		35	

[1] Narodnoye khozyaystvo SSSR v. 1970 p. 141 (hereafter referred to as Narkhoz SSSR).
[2] Izvestiya, Nov. 25, 1971.
[3] Derived from annual gross fixed investment data as reported in Narkhoz SSSR v. 1969, p. 509; v.1967, p. 625, v 1965 p. 538; v 1963, p. 457. Investment data for 1970 obtained from plan fulfillment reports published in SSSR i soyuznye respubliki v 1970 godu, Moscow, 1971. The data refer to total investment, the bulk of which comprises investment in industry and in sectors directly supporting industrial growth.
[4] Data were derived from a variety of regional press sources and reports of foreign broadcasts and are expressed in 1955 prices.

in the developed republics over the next five years. Therefore, since the plans do not clearly favor the lagging republics, existing regional disparities in levels of development should persist. In fact, if industrial growth—which has always been the leading edge of Soviet growth strategy—must depend primarily on increases in factor productivity, regional differences in per capita industrial output probably will continue to increase, with the less developed republics falling still further behind the rest of the country.

Branch of Industry Plans for Output and Technical Progress

Fulfillment of the industrial plan requires the fulfillment (or near fulfillment) of the plans for most of the individual branches because the branches are not only parts of the aggregate production plan but also support each other as suppliers of inputs. The preceding discussion suggests that the following branches are especially crucial: petroleum, particularly to provide exports for foreign exchange; ferrous metals, especially improvements in quality and mix; chemicals, to substitute for other material inputs; and machinery, to provide the equipment (with new technology) for each of the other branches. These are interrelated. For example, if the plan for high quality steel is underfulfilled, then the underproduction of petroleum and chemical equipment may impinge on scheduled improvements in the quality and quantity of output in these branches and, in turn, on the goals for substitution of material inputs and imports of Western technology and equipment.

Fuels and Power

The goals for production of 496 million tons of crude oil and 320 billion cubic meters of natural gas in 1975 (see Table 6) are some-

what ambitious, though not completely untenable. The planned increment in crude oil production of 102 million tons during 1973–75 will require average annual increases of 34 million tons per year—compared with the average annual gains of 21 million tons in 1966–70 and 23 million tons in 1971–72—at a time when production in the older Tatar, Bashkir, Kuybyshev, Azerbaydzhan producing regions has stabilized or begun to decline. The goal for gas production demands an average annual increase of 33 billion cubic meters during 1973–75 compared with an average annual increase of only 13 billion during 1966–72.

TABLE 6.—USSR: GOALS FOR PRODUCTION OF FUELS AND POWER

	Production					Average annual percentage rate of growth[1]	
	Actual		Planned				
	1971	1972	1973	1974	1975	1966–70 (actual)	1971–75 (planned)
Million metric tons:							
Coal (gross output)	641	655	652	670	695	1.6	2.2
Crude oil[2]	372	394	429	461	496	7.6	7.3
Billion cubic meters: Natural gas	212	221	250	280	320	9.2	10.1
Billion kilowatt hours: Electric power	800	858	913	985	1,065	7.9	7.5

[1] Growth rates reflect increases in thei ndividual products listed and may not correspond to the growth rates shown in Table 2 for the entire branch (for example, coal as opposed to the coal products branch).
[2] Excluding gas condensate.

To meet the 1973 goals for oil and gas production—much of which will provide hard currency earnings as exports—technology and equipment will have to be upgraded in all phases of the Soviet oil and gas industries during the next five years. To improve drilling efficiency, the oil industry needs rotary tools for deep drilling and improved technology to cope with operations in permafrost areas. The acquisition of Western technology and equipment could be of considerable help in this regard, and the Soviets have recently placed orders with the US for some rotary drilling equipment. Meeting the 1975 goals for gas production depends largely on the construction of sufficient pipeline to move the gas from the production sites. Although 63,000 kilometers of pipeline are scheduled for construction (30,000 kilometers for oil and 33,000 for gas), compared with 36,000 kilometers in 1966–70, this will require a supply of more than 16 million tons of pipe, at least 6 million tons more than the USSR can produce or currently plans to import during 1971–75.

According to the I–O test described above, the planned production of petroleum products will be enough to satisfy interindustry requirements and consumer needs while providing for increasing exports. If, because of some shortfall in the production of oil and gas, substitution of what the Soviets call more progressive fuels for coal does not occur as rapidly as planned, the USSR still should have little difficulty in satisfying the total demand for fuels through 1975. The planned production of coal in 1973–75 should be sufficient to offset any shortage of petroleum-based fuels, and the goals for coal production through 1975 appear to be within Soviet capabilities. Lags in supplying new coal mining machinery and in constructing new mines, however, will con-

tinue to hamper the ambitious eight-year program (initiated in 1968) to modernize and expand the coal industry.

For the first time since 1954, the planned rate of growth of industrial output exceeds that of electric power. Furthermore, the goal of increasing electric power output by 7.5 percent annually during 1971–75 is less than the gain achieved in the preceding 5 years (7.9 percent). Although the supply of electric power should be sufficient to meet the demands of industry in 1973–75, the planned increases in the population's consumption of electric power may be jeopardized if the goals for introducing new capacity and for reducing consumption of power per unit of industrial output are not realized.

The main thrust of technical advance in the production of electric power will be directed at expanding capacity at thermal power plants by stressing large units (300 megawatts and larger) designed to operate at supercritical pressures and temperatures. These units, which will account for almost half of the new thermal capacity installed over the next five years, are counted on to help achieve an 8 percent reduction in fuel consumption at thermal power plants. Meanwhile, nuclear power will make its first significant contribution to the supply of electric power. Nuclear power plants with a total capacity of 7,200 megawatts are scheduled to provide about 12 percent of the new capacity introduced during the period.

Chemicals

Chemicals are again a favored sector in industrial plans. As before, the emphasis is on rapid expansion of fertilizers, plastics, manmade fibers, and synthetic rubber (see Table 7). Particular stress is being given to the use of plastics as a substitute for metals in machine building; the Published Plan calls for a twofold increase in the use of plastics in motor vehicle production during 1971–75. The planned acceleration in the growth of chemicals is particularly noteworthy. The USSR achieved an average increase of 7.2 percent per year in chemical production in 1971–72, and later increases, particularly those of 13.6 percent and 14.5 percent for 1974 and 1975 respectively, will be still harder to manage.

TABLE 7.—USSR: GOALS FOR PRODUCTION OF MAJOR CHEMICAL PRODUCTS

	Production					Average annual percentage rate of growth	
	Actual		Planned				
	1971	1972	1973	1974	1975	1966–70 (actual)	1971–75 (planned)
Annual percentage increase: Chemicals and petrochemicals	[1] 8.1	[1] 10.5	10.7	13.6	14.5	9.3	11.5
Million metric tons: Mineral fertilizers	61.4	66.1	71.1	80.2	90.0	12.2	10.2
Thousand metric tons:							
Chemical fibers	676	746	828	911	1,065	8.9	11.3
Plastics and synthetic resins	1,862	2,035	2,277	2,759	3,533	11.5	16.1
Million units: Tires	36.2	38.7	42.6	46.6	51.2	5.6	8.2

[1] Plan.

The targets for 1975 require rapid technological gains in an industry characterized by a relatively low level of efficiency. Technical dif-

ficulties were an important factor in the substantial shortfall in the 1966–70 chemical plans. The Soviets hope to achieve a sharp rise in unit production capacity, a wider product assortment, better product quality, and a shift toward more automated production processes. Although the plans for technical progress in the chemical industry resemble those of the preceding five-year period, the tasks must be completed in the period through 1975 at a far more rapid rate than in the preceding five years. For example, the productivity of machinery and equipment used in producing a number of major products must be two to five times the present level by 1975. Growing emphasis on products such as complex (multinutrient) fertilizers and fully-synthetic fibers also means that more advanced and unfamiliar technology will have to be assimilated. To operate the new processes successfully, moreover, the supply and quality of petroleum products used as chemical raw materials must be more dependable than in the past.

The USSR cannot rely solely on its own resources and those of the member countries of the Council for Mutual Economic Assistance, so imports of Western chemical equipment probably will continue at a high level for the next two or three years. Recent purchases and negotiations focus on complete plants or major equipment items for production of petrochemicals, plastics, man-made fibers, and pesticides. The USSR may also be interested in purchasing complex fertilizer plants, thermal furnaces for obtaining phosphorus, equipment for processing plastics into finished articles, and lines for the mechanized packaging and loading of chemical products. Since much of the equipment represents models with which the USSR has had little experience, the "childhood diseases" that generally accompany initial production—especially in the Communist countries—probably will disrupt schedules for construction and operation of new Soviet chemical plants. The larger unit capacities of both domestic and imported installations will pose additional problems. As Western firms have already discovered, the evolution toward huge production installations precludes maintenance of reserve stocks of many critical equipment items because of the large investment required. Thus electrical apparatus, heat-exchangers, seals, and other equipment must have a higher degree of reliability than in the past, and expert inspection and maintenance must be provided. Relative to the developed West, the USSR has had much less experience along these lines, and this inexperience can be expected to add to Soviet difficulties in fulfilling goals for production of chemicals in 1975.

On balance, the production of chemicals will probably fall short of plan. The goals for plastics in the latter years of the plan are especially doubtful, particularly with respect to new items to be used as substitutes for metal products in machinery production.

Ferrous Metals

Qualitative goals for metals are stressed more than quantitative targets in the 1971–75 Plan. None of the major ferrous metal products are slated to grow at a rate above that achieved in the last five years. Still, the USSR will be hard-pressed to fulfill the plan for ferrous

metallurgy. To meet the 1975 target, annual increases in the output of crude steel during 1973–75 must average 6⅔ million tons, compared with the average annual increase of 5 million tons achieved in 1971–72. Despite the campaigns of the past decade, the Soviet steel industry has never achieved an annual increment greater than 6 million tons.

Production of Crude Steel

[Million tons]

Actual:	
1971	121
1972	126
Planned:	
1973	131
1974	138
1975	146

The goals seem particularly dubious in view of the demands being made upon the industry to improve production processes and product quality and to produce a more varied product line. The gains in production efficiency are to be achieved principally by building blast furnaces and oxygen converters with capacities considerably larger than those now employed and by greater use of continuous casting techniques. Higher quality steel is to be produced by wider use of electro-slag, electron beam, and plasma melting techniques, and by expanded use of large electric furnaces. Finally, special attention is to be given to the construction of rolling and finishing facilities to increase the output of rolled steel products needed in the manufacture of motor vehicles, ships, agricultural machinery, pipelines, and consumer goods.

As noted earlier, the planned production of ferrous metals, even if attained, may be insufficient to meet the planned requirements of industry through 1975, particularly if the plans for material savings and substitution are not realized. Thus any shortfalls in steel production will only further aggravate an already questionable planned balance between materials and machinery production.

Machinery

The plan for Soviet machinery output—which includes equipment for investment goods, defense hardware, and consumer durables—calls for an average increase of 11.4 percent per year. Although the growth of consumer durables output will decline somewhat from the exceptionally high rates achieved during 1966–70, a substantial acceleration is slated for output of producer durables—notably petroleum equipment, generators, and chemical equipment. The targets set for machine building through 1975, however, seem unrealistically high in light of the goals for metals, the planned inputs of labor and capital, and the past performance of the machinery sector.

TABLE 8.—U.S.S.R.: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF SELECTED MACHINERY PRODUCTS

	Greenslade-Robertson estimates (1966–70)	Published sample plan (1971–75)
Machine building and metalworking	[1] 8.8	11.4
Producer durables	8.3	13.4
Petroleum equipment	−1.9	15.1
Generators	−5.9	13.8
Chemical equipment	3.7	15.1
Turbines	2.1	8.4
Transformers	2.2	6.5
Forge press machines	3.6	9.5
Metal-cutting machine tools	1.7	4.3
Motor vehicles	8.3	18.0
Electric motors	4.5	9.1
Agricultural machinery	6.0	11.9
Equipment for light industry	8.6	16.3
Consumer durables [2]	15.3	13.5

[1] Discounted growth of GVO in MBMW.
[2] Tovary series; not commodity sample.

The major thrust of the machinery plan is centered on accelerating the production of technologically advanced products which will contribute to the modernization of plant and equipment throughout the industrial sector. This in itself will require considerable renovation of existing machine building enterprises, which probably will slow serial production, at least in the initial phases of any changeover to new equipment and processes. Moreover, the necessary retooling of machinery plants and associated new construction may be delayed until late in the plan period which would only compound the difficulty of meeting the production goals. In fact, most of the shortfall in the overall industrial plan will probably occur in the machinery sector. Thus, much of the tension in the material balance, particularly with respect to ferrous metals, may be reduced in proportion to the expected shortfalls in the machinery production targets.

A great deal of emphasis is being placed on numerical control technology and production of third generation computers. For example, metal-cutting machine tools are scheduled to increase by 4.3 percent annually during 1971–75, while the growth of metal-cutting machine tools with numerical controls will be 33 percent per year. Computer production, a major element of the instrument branch, is to increase by 23 percent per year. Particular difficulties are likely to be encountered in producing this advanced equipment, however, because of the inferiority of Soviet production technology and lack of experience in the series production of such equipment. The planned shift from the production of transistorized computers to computers based on integrated circuits may be especially difficult to accomplish. M. Y. Rakovskiy, Gosplan's vice chairman, claims that the USSR will produce 12,000–15,000 integrated circuit computers in 1971–75. To do this, the USSR would have to produce at least 4,000 computers a year during 1973–75 as no more than a few prototypes were produced in 1971–72.

The Soviets have built prototypes of the RYAD (data processing) and the ASVT (process control) integrated circuit computer systems, which are to serve as the two basic computer families in the 1970s, and true serial production, originally planned for 1970, may begin in 1973.

The slow pace of development and production of the integrated circuit components has been a major factor delaying the scheduled introduction of the third-generation computers.

Meeting requirements for chemical equipment will continue to be another major problem for domestic machine builders. In 1966–70, the USSR shored up domestic output of chemical equipment by imports valued at $1.3 billion, of which three-fifths came from Western firms.

The goals for agricultural equipment, in calling for a rate of increase nearly twice that achieved in the preceding five years, draw attention to a sector which has frequently failed to meet its commitments. As the country's labor supply tends to grow more slowly, the provision of machinery to agriculture becomes a key factor in releasing manpower from agriculture for other sectors. The growth of tractor production and deliveries to agriculture will decline slightly in 1971–75 (see Table 9) but the composition is slated to shift to more productive models.

TABLE 9.—USSR: PRODUCTION AND ALLOCATION OF AGRICULTURAL MACHINERY AND EQUIPMENT[1]

	Average annual percentage rate of growth	
	1966–70 (actual)	1971–75 (planned)
Agricultural machinery	6.0	11.9
Tractors	5.3	4.6
Deliveries to agriculture	5.2	4.2
Trucks	6.7	7.8
Deliveries to agriculture	10.7	11.5

[1] Based on units of production except for agricultural machinery which is based on the ruble value of production.

Scheduled technical improvements in tractors and agricultural machinery include: (1) an increase in engine horsepower and operating speed; (2) greater emphasis on equipment for livestock raising and feeding (where present levels of mechanization are low); (3) increased standardization of parts and components; and (4) improvement in the overall quality and reliability of equipment.

An anomaly of the machinery plan is the discrepancy between the planned growth of the producer durables sample (13.4 percent per year) and the planned growth of gross fixed investment in machinery and equipment throughout the economy (8.1 percent per year). Lags between production and installation of equipment as well as a high rate of growth of equipment exports can explain only a small part of the difference. In the past the recorded growth of investment in machinery and equipment (the utilization of machinery output) has paralleled closely the output of producer durables (the source of machinery)—as it should if the measures of investment and production are accurate.

The 1971–75 plan, however, provides the first opportunity in years to compare planned production of producer durables with the planned use of producer durables. The explanation for the difference between the two plans could be that investment planning is not tied as closely

to production planning as might be thought. Indeed, if those in charge of investment plans are more conservative in their projections than their counterparts in the industrial departments of Gosplan, they are justified in their caution. As noted earlier, very few of the targets for producer durables were attained in the last 5 year plan.[20]

The consumer durables branch of machine building is scheduled to increase at 13.5 percent per year (based on the *tovary* plan) although this growth is not reflected in the Published Plan sample of commodities (Appendix B) which is to grow at about 5 percent per year. The relatively low growth rates suggested by the production data of the Published Plan are misleading, however. The planned increases in the production of some consumer durables (refrigerators, washing machines, TVs, etc.) drastically understate the gains to consumers arising from planned changes in assortment and quality of the products. For example, refrigerators are scheduled to grow at a lower rate in 1971–75 than in 1966–70, but the average capacity of refrigerators produced in 1971–75 will increase as production shifts to larger units. Also, the production of washing machines, which will decline in 1971–75, reflects a planned major shift in composition to semiautomatic and automatic machines.

Passenger car production—though not included in the statistics of consumer durables—will be the fastest growing machinery item in 1971–75. The accelerating production of passenger cars stems from investment made in the last five year plan, notably in the Tol'yatti complex. In 1971–75, the truck rather than the passenger car sector will receive the bulk of motor vehicle industry investments. Indeed, an outstanding feature of the 1971–75 Plan is the determined effort to build and put into production by the end of 1974 a truck-producing complex at Kama which would be the technological equal of any in the West. Kama trucks, if turned out at the planned rate of 150,000 units a year, would meet a longstanding need of the Soviet transportation system—efficient freight service for inter-city hauls and service to areas not accessible by railroads. Construction of the physical facilities is in full swing, and contracts have been signed with Renault of France and Swindell-Dressler of the U.S. for engineering design services for the engine plant and foundry, respectively. Negotiations for contracts for the supply of machinery and equipment are in progress with firms in the U.S., Western Europe, and Japan. Production at Kama probably will not begin before 1976, however, and full production is unlikely before the late 1970s. Although failure to meet the production schedule at Kama before 1975 will not impinge seriously on the five-year plan goal for the number of trucks produced, every month that the project is delayed puts off a badly needed boost to the transportation sector.

[20] A number of factors might explain some of the divergence between the planned production of producer durables and the use of machinery in new fixed investment. For example, (1) spare parts are included in the producer durables sample but not in the new fixed investment, (2) the degree of double-counting implied in the producer durables sample could change, and (3) those machinery series expressed in ruble values may be biased upward by an upward drift in new product prices as well as by increased double-counting. In this connection, it might be noted that the ruble values in the machinery sample in the Published Plan grow by 15.7 percent per year while the items in physical units, when aggregated with the help of 1955 prices, increase by 11.0 percent per year.

Consumer Industries

Despite the Published Plan's stress on bettering the lot of the consumer, production targets for the major consumer industries suggest that the rate of improvement may be no better than in previous plans. According to the Plan, processed foods will grow at a somewhat higher rate than that achieved in 1966–70, but the planned growth of light industry production, particularly sewn goods, will be slower (see Table 10).

TABLE 10.—USSR: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF LIGHT AND FOOD INDUSTRY PRODUCTS

	1966–70 (actual) [1]	1971–75 (planned)
Light industry	7.7	[2] 6.6
Textiles	3.4	4.6
Knitwear	6.4	8.4
Leather footwear	6.8	4.2
Sewn goods	11.7	6.4
Furniture	9.2	10.6
Food industry	4.7	[3] 6.2
Meat	6.4	7.4
Whole milk products	11.0	5.4
Cheese	9.0	5.7
Sugar	−1.8	6.1
Canned fruits and vegetables	9.4	9.3
Confectionary products	4.6	3.9

[1] Based on G–R indexes.
[2] Midpoint of range.
[3] Soviet official GVO data.

The major technological plans for the light and food industries are directed toward reequiping existing enterprises with new machinery and automated processes, based on the latest technology. The output of equipment and spare parts produced for light industry is scheduled to increase by 220 percent over the plan period, and for the food industry by 190 percent. In the textile industry, one-third of the spinning machines and looms are to be replaced by the more productive shuttleless looms and singleprocess spinning machines for chemical fibers. Automated packaging of meat and milk products in polymer materials is planned. There will be an increase in the variety and food value of bread and flour products and an increase in the protein and vitamin content of confectionery products through the use of milk protein (dried skimmed milk and nutritive casein), dried yeast, and protein from oil crops. Considerable expansion of the production of food concentrates is also envisaged.

While existing facilities are modernized, over 500 new light industry enterprises are to be built during the plan period. The average capacity of newly constructed enterprises will exceed that of existing plants by 50 percent to 130 percent. The construction of 120 mechanized bakeries and the introduction of nearly 1000 completely mechanized production lines for making bread are also planned. New construction is to provide about 75 percent of the total growth of dairy capacity. The plans for meat packing are critical, because plant capacity must be expanded to handle the expected gain in volume. During 1966–70, increases in production capacity sometimes could not handle the rise in livestock procurements, and bottlenecks developed at the packing centers.

A comparison of the 1966–70 and 1971–75 technological plans for consumer industries reveals nothing particularly innovative in the new plan. Rather the new plan appears to be little more than an effort to pick up the unfinished pieces of the previous plan. Still, the machine building and construction industries could prove to be a stumbling block in the path of the plans for modernization and expansion of production capacities. During 1966–70, only 58 percent of the planned increase in meat production capacity and just 62 percent of the plan for introducing refrigeration was fulfilled.

Policy Implications of the 1971–75 Plan

The goals of the Ninth Five-Year Plan for industry reflect the same preoccupation with rapid growth of output that almost always has characterized Soviet economic policy. Despite the increased publicity given to consumer-oriented production in the 1971–75 plan, no substantial reallocation of resources in favor of the consumer is evident. Some increase is scheduled in the shares of investment going to agriculture and consumer industries; on the other hand the share of investment in the heavy industrial sectors also will increase at the expense of such consumer-related sectors as housing and education. The leadership has been reasonably satisfied with industrial performance and evidently saw no pressing need to make drastic changes. Despite the slowdown in growth during the 1960s, Soviet industrial growth has been sufficient to support simultaneously an increasing defense effort, a rising level of living, and an expanding industrial base.

The present leadership has also proved to be no more innovative than its predecessors in overall planning strategy. Despite the fact that in none of the previous Five-Year Plans were most of the main industrial goals fulfilled, the leaders apparently believe that they must continue to set higher targets than are likely to be attained in order to elicit maximum effort by workers and managers. Past experience with chronic underfulfillment of unrealistically high goals probably has conditioned the Soviet planners to expect less than they plan. In addition, unwillingness to cut too far the demands of all or most of the major claimants for available resources probably contributes to overambitious targets. Although the Ninth Five-Year Plan on the whole is more realistic than previous plans with respect to the targets for production of industrial materials, the plan continues to reflect overambitious goals for productivity gains and material savings. Thus, neither the planners nor their superiors have been able to bring themselves to experiment with a less taut plan that might prove more resilient when subjected to unexpected shocks. By linking most of the questionable targets—notably those for machinery—to increases in productivity and material savings, however, the leadership has provided both a justification for the production goals and a convenient scapegoat in the event of shortfalls.

Progress Toward Plan Goals in 1971–72

During the first two years of the 1971–75 plan, the growth of industrial output has faltered. Soviet industrial production increased by about 6 percent in 1971 and by about 5½ percent in 1972 (see Table

11), the smallest annual increases since World War II. The industrial slump which began in 1971 and continued in 1972 was the result of factors which have been at work for some time as well as the direct and indirect effects of the decline in agricultural production in 1972. As in the past, overly-ambitious productivity goals were not met, targets for economizing on raw materials fell short of plans, and new plant and equipment was not brought on stream as scheduled.

TABLE 11.—USSR: AVERAGE ANNUAL PERCENTAGE RATES OF GROWTH OF INDUSTRIAL PRODUCTION

	Actual		Plan	Actual	
	1961–65	1966–70	1971–75	1971	[1] 1972
Total industrial output	7.2	7.0	8.0	6.1	5.4
Industrial materials	7.3	6.1	7.0	5.6	5.1
Electric power	11.5	7.9	7.9	8.1	7.4
Coal products	2.7	1.9	3.0	2.6	2.2
Petroleum products and natural gas	10.9	7.9	7.9	7.0	5.7
Ferrous metals	7.9	5.5	5.1	4.1	3.9
Nonferrous metals	8.4	8.6	8.4	5.3	7.0
Forest products	3.0	3.5	5.8	3.8	3.8
Paper and paperboard	7.7	7.2	8.5	5.5	4.6
Construction materials	8.0	6.4	7.1	6.2	5.3
Chemicals	11.7	9.3	11.5	7.9	6.6
Machinery	9.3	8.8	11.4	8.6	8.2
Light industry	2.4	8.0	6.6	4.5	1.3
Food industry	7.0	4.7	6.2	2.9	2.2

[1] Preliminary estimates

The end-of-year reports indicate clearly that, in both 1971 and 1972, Soviet industry did not make the productivity gains or install the new fixed capital that were counted on in the 1971–75 plan. The combined productivity of labor and capital in industry rose by roughly 1½ percent per year in 1971 and 1972, compared with the average increase of 3.7 percent per year planned in 1971–75. Some of the failure in productivity might have been offset by sufficiently large additions to industrial fixed capital, but the growth in fixed capital lagged in both 1971 and 1972. Thus industry was off to a bad start in two areas which Gosplan had made key conditions of the success of the 1971–75 plan.

Another soft spot in 1971–72 was the shortfall in meeting targets for economizing on the use of industrial materials, especially metals. This fact, together with the relatively small increases in the productivity of labor and capital, suggests that improved techniques and equipment are not being assimilated rapidly. Ferrous metallurgy is a case in point. Production of steel by the continuous casting technique is far behind schedule. In fact, the lag in fulfilling the technological plans in ferrous metallurgy prompted an August 1972 party-government resolution severely criticizing the Ministries of Ferrous Metallurgy; Heavy, Power, and Transport Machine Building; Instrument Making, Automation Equipment, and Control Systems; Electrical Equipment Industry; and Installation and Special Construction Work for "feebly" carrying out their task of modernizing the steel industry.

The agricultural situation affected industry by reducing the flow of raw materials and by diverting resources away from industry. The direct effects of the 1972 harvest on raw material supply will be felt mainly in 1973, but industry in 1972 was already on short rations with respect to sugar beets, sunflower seeds, milk, and wool as a consequence

of the 1971 harvest. In addition, the above-normal manpower and transportation requirements of the 1972 planting and harvest periods probably held down industrial activity. More industrial workers than usual were detailed to support farm work, and industrial supply must have been interrupted by the roundup of trucks for agricultural work and especially by the heavy load that the grain harvest in the East and the grain imports put on port facilities and the rail system.

Although a number of sectors shared in the industrial decline, slowdowns in the production of machinery and consumer goods were most noticeable (see Figure 2). Within the machinery sector, production of producer durables—although generally on or close to target—has been flawed by shortfalls in the manufacture of equipment for the chemical, petroleum, light, and food industries. In 1972 these deficiencies were beginning to have an impact. In some branches of industry (chemicals, light industry, and the meat and dairy branch of the food industry), production had been ahead of plan in 1971 and then fell behind plan in 1972. Last September, Premier Kosygin bluntly told a Gosplan audience that the 1971–75 plan was in jeopardy because of the failure to complete new plant and equipment as scheduled.[21] He singled out the light and food industries in this regard. In a speech made to the Supreme Soviet in December, Gosplan Chairman Baybakov pointed to the delayed introduction of production capacities, especially in the ferrous metallurgy, chemical, oil refining and gas industries, and light industry as a cause of the slowdown in industrial growth.[22]

FIGURE 2.—PRODUCTION OF INDUSTRIAL COMMODITIES IN 1972: PLAN VERSUS ACTUAL

[In percent]

Sector	Ahead of plan (by more than 2.5)	Even with plan (within 2.5)	Behind plan (by more than 2.5)
Fuels and power		Electric power (−0.6), oil (−0.7), coal (0.8).	Natural gas (−3.5).
Ferrous metals		Iron (−0.2), steel (0), rolled steel (−0.1), finished rolled steel (−0.9), iron ore (1.0).	
Forest products and paper.		Cellulose (−1.9), paper (1.0)	Commercial timber (−4.9), cardboard (−4.5).
Construction materials		Cement (−0.4), asbestos-cement shingles (2.0), reinforced concrete (0), construction brick (−2.2).	Soft roofing (−4.7), glass (−4.4).
Chemicals		Mineral fertilizer (0.3), pesticides (0.1), plastics and synthetic resins (2.2), chemical fibers (0), tires (−0.8), synthetic washing compounds (−2.0), sulfuric acid (−2.1), soda ash (−0.4).	Caustic soda (−3.6).
Machinery	Electric motors (6.1), instruments and spare parts (6.7), computer equipment (16.2), bulldozers (5.0).	Metal-cutting machine tools (1.0), numerically controlled (−0.4), forge-press equipment (−1.8), diesel engines (−0.8), electric engines (0.3), automobiles (0.2), trucks (−0.2), passenger cars (0.4), buses (1.8), tractor trailers (−2.1), tractors (0.2), farm machinery (−1.0), excavators (0.2), food industry equipment (−1.3), watches and clocks (0.2), television sets (0.5), motorcycles and scooters (1.4), furniture (−1.4).	Turbines (−11.1) generators for turbines (−9.6), oilfield equipment (−15.4), chemical equipment and parts (−9.6), freight cars (−4.3), coal cleaning combines (−10.0), grain harvesting combines (−7.1), light industry equipment (−11.0), radios and radio-phonographs (−5.8), refrigerators (−2.6), washing machines (−15.6), vacuum cleaners (−8.9).

[21] *Planovoye Khozyaystvo*, No. 11, November 1972, p. 4 ff.
[22] *Pravda*, 19 December 1972.

FIGURE 2.—PRODUCTION OF INDUSTRIAL COMMODITIES IN 1972: PLAN VERSUS ACTUAL—Continued

[In percent]

Sector	Ahead of plan (by more than 2.5)	Even with plan (within 2.5)	Behind plan (by more than 2.5)
Soft goods		Linen (−1.8), silk (−1.6)	Cotton (−2.8), wool (−5.6), knitted outer and underwear (−6.2), sewn articles (−3.4), leather shoes (−7.1).
Processed foods		Granulated sugar (−0.7), vegetable oil (1.8), meat (0), butter (−2.4), whole milk products (−2.0).	Canned goods (−3.2), high fat cheese (−4.1).

The magnitude of the 1972 shortfalls forced Soviet planners to abandon many of the targets for 1973 which had been set out in the 5-year plan directives. Production targets for the oil and gas, chemicals, and some machinery products have been scaled down because production capacity has not increased as rapidly as had been planned. The degree of adjustment can be seen in the following comparison of the goals for growth in output in 1973 given, alternatively, in the 5-year-plan directives and in Baybakov's December 1972 speech:

Branch of industry	Percentage growth in output	
	Original plan	Revised plan
All industry	7.8	5.8
Oil	8.7	7.5
Gas	9.2	7.7
Chemicals	10.7	8.5
Machinery	11.4	10.4
Soft goods	6.7	4.0
Processed foods	7.7	2.0

The much lower goals for production of soft goods and processed foods reflect the delays in getting new capacity into production, but expected shortages of raw material to produce meat, vegetable oil, sugar, wool, and linen also dictated a retreat from the goals set out in the 5-year plan directives.

So far the major official response to Soviet industrial difficulties has been a decree declaring that the production association will become the basic element of industrial organization.[23] The new decree calls for a consolidation of industrial enterprises and complementary research organizations and design bureaus to be carried out in 1973–75. As the associations assume greater responsibilities for detailed management of production, investment, and research, the ministries are to lose much of their operational powers. Industries with few enterprises will be combined in a single association while industries with numerous enterprises will be parceled out among several regional associations.

The concept of the production association is sound because there are substantial economies of scale and specialization that have not yet

[23] *Pravda*, 3 April 1973. The number of production associations increased rapidly in the early 1960's, but the amalgamation movement slowed after 1965 when the economic reform came to the fore. By 1970, production associations accounted for only 8 percent of industrial production.

been realized in Soviet industry. If applied research and development work also can be brought under the associations' umbrella, the union could also help to alleviate the perennial complaint of the lack of communication between R. & D. and the process of introducing new technology at the enterprise level. Therefore, the move to production associations is an interesting development.

It remains to be seen whether the associations will be able to fulfill their promise if production targets and allocations of inputs continue to be decided at higher levels. In previous reorganizations, ministries and local governments have resisted stubbornly any diminution of their powers. In this reorganization, many of the enterprises assigned to associations may also be reluctant to lose their independence.

Outlook

Although many of the production goals in the 1971–75 plan are modest compared with those in previous plans, the extremely ambitious targets for productivity gains and material savings, the failure to fulfill earlier plans, and industry's sluggish performance through 1972 almost certainly mean that many of the primary goals of the new 5-year plan will not be met. The plans for technical progress—both in terms of aggregate productivity and in terms of plant modernization—are especially questionable. Heavy requirements are placed on the machine building sector in the new plan, and considerable retooling of existing machine building plants will be required.

Failure to meet the goals for productivity or material savings will not cripple completely the plan for industry, however. As in the past, the planners will supply more manpower than intended so as to offset part of the shortfall in productivity. The consequences will be felt mainly in the service sector, whose expansion depends on a continuing increase in its labor force. Moreover, the tension in the material balance which is inherent in the plan goals is likely to be mitigated as the plan period unfolds. For example, much of the seeming gap between the supply of and demand for metals is the direct result of an unrealistically high plan for machinery. Thus the tension will be reduced in proportion to the expected shortfall in the attainment of targets for machinery production.

Clearly, the Soviets will have to rely on imports for some of the key equipment and technology if current plans to upgrade the level of industrial technology are to be realized. Recent Soviet efforts to boost imports from the West, particularly from the United States, bear this out. Aside from equipment for truck production, the Soviets have expressed particular interest in chemical equipment, numerical control technology, and integrated circuit equipment. Although increased imports of Western processes and equipment would undoubtedly contribute to the pool of Soviet technology, such contributions are unlikely to be forthcoming in sufficient quantity, and soon enough, to ensure fulfillment of the plan goals for technical progress in 1973–75. The principal obstacles to expanding imports of Western processes and equipment as much as the Soviets would like will be the cost of continued grain purchases, growing indebtedness to Western trading partners, and the problem of generating offsetting exports. In the short run, the USSR must secure a substantial increase in

credits if it is to finance a flow of technology on a scale sufficient to influence the course of the 1971–75 plan.

For the reasons outlined above, the rate of growth of industrial output in the USSR in 1973–75 is unlikely to be greater than 6.5 percent per year and may fall below 6 percent. Projections based on the probable supply of labor and capital tend toward the high side of the range. On the other hand, the still uncharted difficulties that will ensue from the poor harvest in 1972 may pull Soviet industrial growth toward the lower end of the range. Indeed, the problems caused by the contraction in the supply of agricultural products to industry, reinforced by the failure to maintain the present plan schedule in a number of instances, may well lead to further revamping of the plan for 1974–75. The adjustments would scale down goals which are deemed unattainable, take account of any production lost by failure to maintain machinery imports at the planned level, and possibly provide additional support to agriculture.

Within the leadership, however, the difference between an 8 percent and a 6 percent expansion of industrial output will not count as heavily as the progress in bringing the USSR into the first rank in terms of the variety and technical sophistication of its industrial products. Five years is too brief a period to expect a substantial closing of the technological gap which exists between the USSR and the major Western powers. Nevertheless, the Soviet machinery sector—on its past record—may do well simply to keep the gap from widening.

Appendix A

Consistency Test of Soviet Industrial Production Goals for 1975

Soviet industrial production plans for 1971–75 were tested for consistency with the help of a 23-sector input-output table. The input-output technique makes it possible to determine the material inputs from each of the 23 sectors needed to produce the planned output of all of the 23 sectors. The technique may be described with the help of the model shown below:

Sectors As Consumers

Sectors As Producers	A (1)	B (2)	C (3)	D (4)	. . .	W (23)	Final Demand
A (1)		a_B					
B (2)	b_A	b_B	b_C	b_D	. . .	b_W	b_{FD}
(C) (3)		c_B					
D (4)		d_B					
. . .		. . .				. . .	
W (23)		w_B					

where: A, B, C, D . . . W are producing sectors,

a_B is the portion of output of Sector A consumed by Sector B

b_A is the portion of output of Sector B consumed by Sector A, etc., and

b_{FD} is the portion of output of Sector B consumed by household and government consumption, investment, defense, and exports.

Also $\Sigma(b_A + b_B + b_C + b_D \ldots b_W)$ = total output of Sector B consumed by all producing sectors

and $\Sigma(a_B + b_B + c_B + d_B \ldots w_B)$ = total inputs consumed by Sector B from all producing sectors.

The gross output of each sector can be divided into two components based on the following relation: the gross output of any producing sector (X) is equal to its deliveries to all producing sectors (AX) plus its deliveries to final end uses (F). So $X=AX+F$. Thus, it is possible to test the consistency of the 5-year plan by focusing on what is left of gross output after satisfying interindustry requirements in 1975—that is, $F=X-AX$.[1] According to this test, the 1971–75 plan (even assuming that the goals for changes in input coefficients are met) is inconsistent if the output goals for some materials are too low to supply other sectors and at the same time have reasonable quantities left over for deliveries to the final demand categories of consumption, investment, defense, or exports.

Using the 1966 Soviet input-output table as a base, the actual gross outputs of each sector in 1966, 1970, and 1975 were divided into interindustry deliveries and deliveries to final end uses.[2] Since the production relations, or input-output coefficients, were not the same in 1970 as they were in 1966, and as further changes in these relations will occur by 1975, it was necessary to estimate indirectly the rate of change in the input-output coefficients between 1966–70 and to predict the rate of change likely to occur in 1971–75. First, actual interindustry deliveries (AX) required to support the sector final demands in 1970 were derived from the relation $AX=X-F$, since X was known and F could be obtained from estimates of Soviet GNP by end use. The ratios of these estimated interindustry deliveries in 1970 to the interindustry deliveries implied by the actual 1966 input-output coefficients reflect changes in production relations between 1966 and 1970. These ratios were then arrayed in a diagonal matrix and used together with the matrix of 1966 full input coefficients to estimate a matrix of 1970 full input coefficients (i.e., the 1966 matrix was multiplied by the diagonal matrix). The resultant matrix of 1970 full input coefficients was inverted to obtain a matrix of estimated 1970 direct input coefficients which satisfied the relationship $AX_{70}=X_{70}-F_{70}$. Upon inspection, this procedure seemed to yield usable (although not unique) estimates of the direct input coefficients for 1970. The implied changes were in the right direction and the implied interindustry deliveries in 1970 were of reasonable magnitude.

In estimating direct input coefficients for 1975, it was assumed that in most sectors the ratios would continue to change in 1971–75 as they did between 1966 and 1970.[3] The 1970 coefficients of some sectors, however, were adjusted on the basis of published plans for changes in input coefficients in 1971–75. Specifically, the 1970 coefficients were reduced as follows:

Row sector	Column sector	Reduction (percent)
Woodworking	Construction	19.0
Ferrous metals	do	10.0
Do	MBMW	18.6
Construction materials	Construction	10.0
Timber	do	19.0
Do	Woodworking	8.3
Do	Pulp and paper	34.0
Electric power	All sectors	7.2
Fuels	do	8.5
Chemicals	do	8.5

Finally, taking into account these planned changes in the 1970 input-output coefficients, estimates of actual interindustry deliveries and deliveries to final end uses were calculated for 1975. These estimates are reported in Table A–1. Table A–2 shows the average annual rates of growth of gross output, interindustry deliveries, and deliveries to final end uses in 1967–70 and 1971–75.

[1] In matrix notation: If X is the vector of gross outputs and A is the matrix of input-output coefficients, AX is the matrix of inputs required to produce the gross outputs (X)—i.e., the interindustry deliveries. Then, $X-AX=F$ is the vector of outputs available for use outside the productive sectors (i.e. final demand). See Table A–1.

[2] All of the I–O analysis carried out in this paper depends on a 70-sector I–O table for the USSR in 1966 in producer prices. This table was derived by Vladimir G. Treml, Barry L. Kostinsky, Kurt W. Kruger, and Dimitri M. Gallick. Their work will apear in a forthcoming publication: US Department of Commerce, Bureau of Economic Analysis, Foreign Economic Report, No. 1. *Conversion of Soviet Input-Output Tables to Producers Prices: the 1966 Reconstructed Table,* Washington, D.C.

[3] Algebraically,

$$\frac{X_{70}-F_{70}}{[(I-A_{66})^{-1}-I]F_{70}}$$

TABLE A-1.—USSR: INPUT-OUTPUT RELATIONS[1]

	Interindustry deliveries				Deliveries to final demand				Gross output, million rubles		
			1975				1975				
	1966	1970	Projected coefficients[2]	Planned coefficients[3]	1966	1970	Projected coefficients[2]	Planned coefficients[3]	1966	1970	1975
1. Ferrous ores	672	872	1,245	1,245	202	263	298	298	873	1,135	1,543
2. Ferrous metals	11,676	14,313	19,899	18,934	825	977	−267	698	12,502	15,290	19,632
3. Nonferrous ores	1,562	1,866	2,391	2,391	−346	−220	−87	−87	1,216	1,646	2,304
4. Nonferrous metals	6,161	8,247	12,860	12,860	572	871	817	817	6,734	9,118	13,677
5. Coal	4,343	4,601	5,140		693	722	1,036		5,035	5,323	6,176
6. Petroleum	3,787	5,008	7,358	12,675	1,431	1,955	2,641	4,350	5,219	6,963	9,999
7. Natural gas	294	387	573		33	65	277		327	452	850
8. Electric power	4,936	6,274	9,130	8,778	959	1,767	2,634	2,986	5,895	8,041	11,764
9. Machine building and metalworking	21,321	31,700	56,723	56,723	33,533	45,233	75,447	75,447	54,854	76,933	132,170
10. Chemicals	11,578	15,717	25,460	22,444	2,273	3,443	7,495	10,511	13,851	19,160	32,955
11. Timber	3,028	3,197	3,781	3,997	455	485	322	106	3,483	3,682	4,103
12. Woodworking	5,624	6,495	8,318	8,078	2,146	2,863	5,354	5,594	7,770	9,358	13,672
13. Paper and pulp	1,284	1,446	1,844	1,844	87	124	509	509	1,371	1,570	2,353
14. Construction materials	9,663	11,643	15,002	14,701	1,026	1,209	3,081	3,382	10,690	12,852	18,083
15. Soft goods	27,915	34,006	45,064	45,064	16,816	22,306	32,364	32,364	44,731	56,312	77,429
16. Processed foods	22,764	26,768	34,876	34,876	38,007	46,773	64,405	64,405	60,772	73,541	99,281
17. Other industry	3,759	5,077	7,630	7,630	7,060	8,728	13,630	13,630	10,819	13,805	21,260
18. Construction	0	0	0	0	43,312	56,133	77,464	77,464	43,312	56,133	77,464
19. Crops	29,995	35,546	45,499	45,499	12,769	11,654	13,517	13,517	42,765	47,200	59,016
20. Animal husbandry	22,378	22,739	24,434	24,434	14,491	20,047	26,814	26,814	36,869	42,786	51,248
21. Freight transportation and productive communications	14,153	18,225	26,324	26,324	4,847	6,209	7,046	7,046	19,000	24,434	33,370
22. Trade and distribution	4,105	7,132	14,945	14,945	12,045	14,929	16,337	16,337	16,150	22,061	31,282
23. Other branches	1,434	1,737	2,289	2,289	1,922	2,382	3,340	3,340	3,356	4,119	5,629

[1] Based on 1966 I–O coefficients adjusted as explained in the text of Appendix A. Because of rounding, components may not add to totals shown.

[2] 1970 coefficients projected to 1975 at the same rate of change as occurred between 1966 and 1970.

[3] Includes planned changes in input coefficients in 1971–75.

TABLE A-2.—USSR: AVERAGE ANNUAL RATE OF GROWTH OF INTERINDUSTRY DELIVERIES, DELIVERIES TO FINAL DEMAND, AND GROSS OUTPUT[1]

[In percent]

	Interindustry deliveries			Deliveries to final demand			Gross output	
		1971–75			1971–75			
	1967–70	Projected Coefficients[2]	Planned Coefficients[3]	1967–70	Projected coefficients[2]	Planned coefficients[3]	1967–70	1971–75
1. Ferrous ores	6.7	7.4	7.4	6.8	2.5	2.5	6.8	6.3
2. Ferrous metals	5.2	6.8	5.8	4.3	(4)	6.5	5.2	5.1
3. Nonferrous ores	4.5	5.1	5.1	(4)	(4)	(4)	7.9	7.0
4. Nonferrous metals	7.6	9.3	9.3	11.1	−1.3	−1.3	7.9	8.4
5. Coal	1.5	2.2	-------	1.0	7.5	-------	1.4	3.0
6. Petroleum	7.2	8.0	4.9	8.1	6.2	9.7	7.5	7.5
7. Natural gas	7.1	8.2	-------	18.5	33.6	-------	8.4	13.5
8. Electric power	6.2	7.8	6.9	16.5	8.3	11.1	8.1	7.9
9. Machine building and metalworking	10.4	12.3	12.3	7.8	10.8	10.8	8.8	11.4
10. Chemicals	7.9	10.1	7.4	10.9	16.8	25.0	8.4	11.5
11. Timber	1.4	3.4	4.6	1.6	−7.9	−26.2	1.4	2.2
12. Woodworking	3.7	5.1	4.5	7.5	13.3	14.3	4.8	7.9
13. Paper and pulp	3.0	5.0	5.0	9.3	32.6	32.6	3.4	8.4
14. Construction materials	4.8	5.2	4.8	4.2	20.6	22.8	4.7	7.1
15. Soft goods	5.1	5.8	5.8	7.3	7.7	7.7	5.9	6.6
16. Processed foods	4.1	5.4	5.4	5.3	6.6	6.6	4.9	6.2
17. Other industry	7.8	8.5	8.5	5.4	9.3	9.3	6.3	9.0
18. Construction	0	0	0	6.7	6.7	6.7	6.7	6.7
19. Crops	4.3	5.1	5.1	−2.3	3.0	3.0	2.5	4.6
20. Animal husbandry	0.4	1.4	1.4	8.5	6.0	6.0	3.8	3.7
21. Freight transportation and productive communications	6.5	7.6	7.6	6.4	2.6	2.6	6.5	6.4
22. Trade and distribution	14.8	15.9	15.9	5.5	1.8	1.8	8.1	7.2
23. Other branches	4.9	5.7	5.7	5.5	7.0	7.0	5.3	6.4

[1] Derived from data in Table A–1.
[2] 1970 coefficients projected to 1975 at the same rate of change as occurred between 1955 and 1970.
[3] Includes planned changes in input coefficients in 1971–75.
[4] Absolute deficit in the terminal year.

The results of the test indicate that unless input coefficients change more rapidly than planned in 1971–75, there will be a shortage of metals and timber, while plastics, natural gas, and construction materials will be in excess supply. In 1967–70, the rate of growth of deliveries of ferrous metals to final demand was 3.9 percent per year. Even if the use of ferrous metals per ruble of output were to decline at the same rate in 1971–75 as it did in 1967–70, there still would not be enough ferrous metals to satisfy the requirements inherent in the 1975 goals for gross output by branch. Under the same assumption—that input coefficients change at the same speed in 1971–75 as they did in 1967–70—Soviet industry would also have problems in providing enough nonferrous metals and timber. On the other hand, deliveries to final demand of chemicals, woodworking and paper products, construction materials, and machinery would accelerate considerably if the plans are met.

Some of the tightness in the supply of ferrous metals and electric power would be relieved if the goals given in the Published Plan for changes in input coefficients are met. There still would be a decline in the quantity of ferrous metals available for deliveries to final demand (primarily exports), but the situation would be more manageable. Nonferrous metals, for which no savings goals have been revealed, however, would remain a problem as would timber, despite the planned goals for substantial savings in the use of commercial timber in 1971–75.

Appendix B

PUBLISHED PLAN SAMPLE OF MAJOR INDUSTRIAL PRODUCTS

Sector and units	Production[1] Actual 1965	Actual 1970	Planned 1971	Planned 1972	Planned 1973	Planned 1974	Planned 1975	Annual rates of growth (percent) 1971	1972	1973	1974	1975	Average annual rate of growth (percent) 1966–70	1971–75
Gross industrial output (billion rubles)	--------	373	398.7	430.4	464.0	503.9	547	6.9	8.0	7.8	8.6	8.6	[2]7.0	8.0
Fuels and power:														
Electric power (billion kilowatt hours)	506.7	740.9	790	850	913	985	1,065	6.6	7.6	7.4	7.9	8.1	7.9	7.5
Oil (without gas condensate) (million tons)	241.7	348.8	371.3	395.1	429	461	496	6.5	6.4	8.6	7.5	7.6	7.6	7.3
Natural Gas (billion cubic meters)	127.7	197.9	211	229	250	280	320	6.6	8.5	9.2	12.0	14.3	9.2	10.1
Coal (million tons)	577.7	624.1	620.4	634	651.5	670.2	694.9	−0.6	2.2	2.8	2.9	3.7	1.6	2.2
Shales (million tons)	21.3	24.3	NA	NA	NA	NA	32.7	NA	NA	NA	NA	NA	2.7	6.1
Peat (million tons)	45.5	57.3	NA	NA	NA	NA	78.3	NA	NA	NA	NA	NA	4.7	6.4
Firewood (million cubic meters)	83.4	69	NA	NA	NA	NA	55.5	NA	NA	NA	NA	NA	−3.7	−4.3
Metals:														
Coke (million tons)	67.5	75.4	NA	NA	NA	NA	88.5	NA	NA	NA	NA	NA	2.2	3.3
Iron ore (million tons)	153.4	195.5	NA	NA	NA	NA	248	NA	NA	NA	NA	NA	5.0	4.9
Pig iron (million tons)	66.2	85.9	89.1	92.5	97.1	101.9	108.5	3.7	3.8	5.0	4.9	6.5	5.3	4.8
Crude steel (million tons)	91.0	115.9	119.9	125.5	130.9	138.1	146.4	3.5	4.7	4.3	5.5	6.0	5.0	4.8
Steel pipe (million tons)	9.0	12.4	13.2	13.7	14.6	16	17.5	6.5	3.8	6.6	9.6	9.4	6.6	7.1
Finished rolled steel (million tons)	61.6	80.6	83.5	88	91.9	97.3	103.5	3.6	5.4	4.4	5.9	6.4	5.5	5.1
Aluminum (1970=100)	--------	100	106.2	116.9	129.4	144.1	160	6.2	10.1	10.7	11.4	11.0	NA	9.9
Copper (refined) (1970=100)	--------	100	107	112.8	118	128.1	141	7.0	5.4	4.6	8.6	10.1	NA	7.1
Chemicals and petrochemicals (billion rubles)	--------	21.1	22.8	25.2	27.9	31.7	36.3	8.1	10.5	10.7	13.6	14.5	[2]9.3	11.5
Mineral fertilizer (million tons)	31.2	55.4	61.3	65.9	71.1	80.2	90	10.6	7.5	7.9	12.8	12.2	12.2	10.2
Delivery to agriculture (million tons)	27.1	45.6	50.5	54.4	58.3	65	75	10.7	7.7	7.2	11.5	15.4	11.0	10.5
Plastics and synthetic resins (thousand tons)	971.1	1,672.6	1,785.4	1,991.7	2,277.4	2,758.6	3,533	6.7	11.6	14.3	21.1	28.1	11.5	16.1
Chemical fibers (thousand tons)	407.3	623	672.3	745.5	828	911	1,065	7.9	10.9	11.1	10.0	16.9	8.9	11.3
Caustic soda (thousand tons)	1,206.5	1,782.6	1,872.1	1,970	2,146	2,366	2,705	5.0	5.2	8.9	10.3	14.3	8.1	8.7
Soda ash (thousand tons)	2,734.3	3,484.7	3,776	3,865	4,191	4,520	4,933	8.4	2.4	8.4	7.9	9.1	5.0	7.2
Tires (million units)	26.4	34.6	36.3	39	42.6	46.6	51.2	4.9	7.4	9.2	9.4	9.9	5.6	8.2
Household chemicals (million rubles)	NA	1,095	1,184.1	1,315.9	1,481	1,692.1	2,037.8	8.1	11.1	12.5	14.3	20.4	NA	13.2
Pesticides (thousand tons)	197.6	291.6	NA	NA	NA	NA	424	NA	NA	NA	NA	NA	8.1	7.8
MBMW (billion rubles)	--------	84.8	93.3	104.2	116.1	129.8	145.7	10.0	11.7	11.4	11.8	12.2	8.8	11.4
Turbines (million kilowatts)	14.6	16.2	16.8	16.4	20.6	22.3	24.2	3.7	−2.4	25.6	8.3	8.5	2.1	8.4
Main line freight cars (thousand units)	39.6	58.6	64.5	72.55	79	89	95	10.1	12.5	8.9	12.7	6.7	8.2	10.1
Generators (million kilowatts)	14.4	10.6	14.5	15.0	17.9	19.7	20.2	36.8	3.4	19.3	10.1	2.5	−5.9	13.8
Electric motors (million units)	4.69	5.84	6.35	6.88	7.6	8.14	9.02	8.7	8.3	10.5	7.1	10.8	4.5	9.1
Transformers (million kilovolt-amperes)	95	106	110.5	115	126	135	145	4.2	4.1	9.6	7.1	7.4	2.2	6.5
Chemical equipment and spare parts (million rubles)	387.5	464.2	547.7	630.8	711.5	823.6	937.6	18.0	15.2	12.8	15.8	13.8	3.7	15.1
Oil equipment (thousand tons)	139.7	126.6	159	185.5	205	228.5	256	25.6	16.7	10.5	11.5	12.0	−1.9	15.1
Metalcutting machine tools (thousand units)	186.1	202.3	201.45	207.5	219	233	250	−0.4	3.0	5.5	6.4	7.3	1.7	4.3
Forge-press machines (thousand units)	34.6	41.3	41.7	44.3	47.8	54.3	65	1.0	6.2	7.9	13.6	19.7	3.6	9.5

See footnotes at end of table.

PUBLISHED PLAN SAMPLE OF MAJOR INDUSTRIAL PRODUCTS—Continued

Sector and units	Production[1] Actual 1965	Actual 1970	Planned 1971	Planned 1972	Planned 1973	Planned 1974	Planned 1975	Annual rates of growth (percent) 1971	1972	1973	1974	1975	Average annual rate of growth (percent) 1966–70	1971–75
Gross industrial output (billion rubbles)—Continued														
MBMW (billion rubbles)—Continued														
Instruments and spare parts (million rubles)	1,444	3,079.3	3,310	3,868.1	4,487.4	5,359	6,307.8	7.5	16.9	16.0	19.4	17.7	16.4	15.4
Computers (million rubles)	170.1	709.7	768.2	1,015.9	1,283.55	1,602.3	1,999.2	8.2	32.2	26.3	24.8	24.8	33.0	23.0
Motor vehicles (thousand units)	616.3	916.1	1,121.8	1,376.2	1,702.8	1,987.1	2,100	22.5	22.7	23.7	16.7	5.7	8.3	18.0
Passenger cars (thousand units)	201.2	344.2	513.1	728.1	977.1	1,204.1	1,260	49.1	41.9	34.2	23.2	4.6	11.3	29.6
Buses (thousand units)	35.5	47.4	48.7	51.1	57.2	64.5	75	2.7	4.9	11.9	12.8	16.3	6.0	9.6
Trucks (thousand units)	379.6	524.5	560	597	668.5	718.5	765	6.8	6.6	12.0	7.5	6.5	6.7	7.5
Deliveries to agriculture (thousand units)	94.3	156.5	168.5	187	224.5	250	270	7.7	11.0	20.1	11.4	8.0	10.7	11.6
Tractors (thousand units)	354.5	458.5	470	478	502	542	575	2.5	1.7	5.0	8.0	6.1	5.3	4.2
Deliveries to agriculture (thousand units)	239.5	309.3	316.5	316.5	328.5	357.8	380.7	2.3	0	3.8	8.9	6.4	5.2	4.8
Grain combines (thousand units)	85.8	99.2	102	103	94	123	138	2.8	1.0	−8.7	30.9	12.2	3.0	6.8
Deliveries to agriculture (thousand units)	79.4	97.2	99	99.8	90.5	119.4	134.4	1.9	.8	−9.3	31.9	12.6	4.1	6.7
Excavators (thousand units)	21.6	31	33.1	34.9	38	40.75	43.7	6.8	5.4	8.9	7.2	7.2	7.5	7.1
Deliveries to agriculture (thousand units)	NA	NA	15.1	16.1	17.3	18.6	20	NA	6.6	7.5	7.5	7.5	NA	NA
Bulldozers (thousand units)	20.1	33.5	36.25	38.1	39	41	45	8.2	5.1	2.4	5.1	9.8	10.8	6.1
Deliveries to agriculture (thousand units)	NA	NA	12	14.1	16.3	18.3	21.3	NA	17.5	15.6	12.3	16.4	NA	NA
Agricultural machinery (million rubles)	1,582	2,114	2,335.5	2,640.8	2,978	3,323.8	3,702.2	10.5	13.1	12.8	11.6	11.4	6.0	11.9
Equipment and spare parts:														
For light industry (million rubles)	288	434.2	479.3	549.3	669.7	793.7	925.6	10.4	14.6	21.9	18.5	16.6	8.6	16.3
For food industry (million rubles)	219	337	346	385	457	544	650	2.7	11.3	18.7	19.0	19.5	9.0	14.0
Consumer durables:														
Cameras (thousand units)	1,053	2,044.7	NA	NA	NA	NA	3,250	NA	NA	NA	NA	NA	14.2	9.7
Washing machines (thousand units)	3,430	5,243	NA	NA	NA	NA	3,500	NA	NA	NA	NA	NA	8.9	−7.8
Vacuum cleaners (thousand units)	800	1,509	NA	NA	NA	NA	4,000	NA	NA	NA	NA	NA	13.5	21.5
Tape recorders (thousand units)	453	1,192	NA	NA	NA	NA	2,734	NA	NA	NA	NA	NA	21.3	18.1
Radios (thousand units)	5,160	7,815	8,960	9,343	9,785	10,398	11,100	14.7	4.3	4.7	6.3	6.8	8.7	7.3
Refrigerators (thousand units)	1,675	4,140	4,568	5,131	5,782	6,288	6,901	10.3	12.3	12.7	8.8	9.7	19.8	10.8
Motorcycles and motorbikes (thousand units)	711	832.7	857	886	923	971.5	1,200	2.9	3.4	4.2	5.3	23.5	3.2	7.6
Television sets (thousand units)	3,655	6,682	5,755	5,970	6,120	6,340	6,600	−13.9	3.7	2.5	3.6	4.1	12.8	− 0.2
Watches and clocks (million units)	30.6	40.2	41.7	44	47.8	51.3	55.2	3.7	5.5	8.6	7.3	7.6	5.6	6.5
Forest products and paper:														
Commercial timber (millions cubic meters)[2]	255	278.1	283.7	287.4	295.1	302.2	309.9	2.0	1.3	2.7	2.4	2.5	1.7	2.2
Particle board (thousand cubic meters)	798.4	1,994.5	2,289	2,665.9	3,253	4,235	5,657	14.8	16.5	22.0	30.2	33.6	20.1	23.2
Fiber board (million cubic meters)	138.3	208.3	234.8	272.5	368.6	488.6	572.1	12.7	16.1	35.3	32.6	17.1	8.5	22.4
Lumber (million cubic meters)	85.0	89.11	NA	NA	NA	NA	92.1	NA	NA	NA	NA	NA	0.9	0.7
Plywood (thousand cubic meters)	1,756.1	2,045.1	NA	NA	NA	NA	2,650	NA	NA	NA	NA	NA	3.1	5.3
Cellulose (thousand tons)	3,234	5,109.5	5,447	5,812	6,637	7,496	8,490	6.6	6.7	14.2	12.9	13.3	9.6	10.7
Paper (thousand tons)	3,231	4,158.3	4,361.5	4,556.0	4,855.5	5,173.8	5,563.7	4.9	4.5	6.6	6.6	7.5	5.2	6.0
Cardboard (thousand tons)	1,449	2,516	2,703.7	2,931.8	3,474.5	4,049.7	4,460.3	7.5	8.4	18.5	16.6	10.1	11.7	12.1
Furniture (million rubles)	1,803	2,804.7	2,990.4	3,345.1	3,682.2	4,086.1	4,633.2	6.6	11.9	10.1	11.0	13.4	9.2	10.6

Construction materials:														
Cement (million tons)	72.4	94.3	99	103.4	108.5	116.2	125	5.0	4.4	4.9	7.2	7.5	5.4	5.8
Asbestos cement shingles (billion standard units)	4.16	5.83	6.1	6.47	6.83	7.25	7.75	4.6	6.1	5.6	6.1	6.9	7.0	5.9
Soft roofing and insulation (million square meters)	1,082.5	1,334	1,370	1,450	1,620	1,800	2,000	2.7	5.8	11.7	11.1	11.1	4.3	8.4
Construction glass (million square meters)	201.1	244.6	246.1	259.5	271.8	285.1	302.5	.6	5.4	4.7	4.9	6.1	4.0	4.3
Asbestos cement pipes and couplings (thousand kilometers standard pipe)	32.1	51	NA	NA	NA	NA	70	NA	NA	NA	NA	NA	9.7	6.5
Building bricks (excluding kolkhoz production) (billion units)	43.4	51.5	NA	NA	NA	NA	63.6	NA	NA	NA	NA	NA	3.5	4.3
Reinforced concrete construction (million cubic meters)	54.4	82	NA	NA	NA	NA	117	NA	NA	NA	NA	NA	8.6	7.4
Light industry:														
Textiles (billion square meters)	7.32	8.85	9.45	9.6	10.1	10.45	11.1	6.8	1.6	5.2	3.5	6.2	3.9	3.6
Cotton (billion square meters)	5.5	6.15	6.6	6.6	6.9	7	7.3	7.3	0	4.5	1.4	4.3	2.3	3.5
Linen (million square meters)	548	706.7	760	789.6	821.4	853.7	887.7	7.5	3.9	4.0	3.9	4.0	5.2	4.7
Wool (million square meters)	466	642.9	685.2	721.5	768.5	825.1	892.2	6.6	5.3	6.5	7.4	8.1	6.6	6.8
Silk (million square meters)	801	1,146.1	1,193.5	1,291	1,351	1,461	1,705.5	4.1	8.2	4.6	8.1	16.7	7.4	8.3
Knitwear (million units)	906.2	1,236.4	1,353.2	1,442.2	1,529.2	1,635.3	1,848.5	9.4	6.6	6.0	6.9	13.0	6.4	8.4
Sewn goods (billion rubles)	9.2	16	17	17.9	18.9	19.8	21.8	6.2	5.3	5.6	4.8	10.1	11.7	6.4
Leather footwear (million pair)	486	675.7	708	728	759	791	830	4.8	2.8	4.3	4.2	4.9	6.8	4.2
Food industry:														
Sugar (thousand tons) [4]	8,924	8,139	8,910	8,956	10,056	10,481	10,932	9.5	0.5	12.3	4.2	4.3	−1.8	6.1
Vegetable oil (thousand tons) [5]	2,327	2,345	2,582	2,967	3,130	3,240	3,390	10.1	14.9	5.5	3.5	4.6	0.2	7.6
Meat (thousand tons) [5]	4,867	6,630	6,938	7,524.5	8,059	8,689	9,462	4.6	8.5	7.1	7.8	8.9	6.4	7.4
Butter (thousand tons) [5]	1,069	959.8	1,016	1,093	1,130	1,189	1,235	5.9	7.6	3.4	5.2	3.9	−2.1	5.2
Whole milk products (million tons)	11.5	19.4	20.1	20.3	21.6	23.1	25.2	3.6	1.0	6.4	6.9	9.1	11.0	5.4
Cheese (thousand tons) [5]	303	467.2	498	508	543	571	616	6.6	2.0	6.9	5.2	7.9	9.0	5.7
Fish products (million rubles)	NA	2,283	2,535	2,600	2,800	3,050	3,356	11.0	2.6	7.7	8.9	10.0	NA	8.0
Feed yeast (thousand tons)	NA	260.5	310.2	365.1	496	665.4	978	19.1	17.7	35.9	34.2	47.0	NA	30.3
Flour (million tons) [6]	27.9	31.7	31.3	33.35	33.65	33.9	34.15	−1.3	6.5	0.9	0.7	0.7	2.6	1.5
Groats (thousand tons) [5]	2,127	2,819	3,000	3,215	3,390	3,570	3,720	6.4	7.2	5.4	5.3	4.2	5.8	5.7
Mixed feed (million tons)	15.5	23.7	24.5	26.9	28.4	31.3	34.9	3.4	9.8	5.6	10.2	11.5	8.9	8.0
Canned meat (million standard cans)	622.6	703	NA	NA	NA	NA	950	NA	NA	NA	NA	NA	2.5	6.2
Canned milk (million standard cans)	707	1,104	NA	NA	NA	NA	1,500	NA	NA	NA	NA	NA	9.3	6.3
Canned fruits and vegetables (million standard cans)	5,031	7,873	NA	NA	NA	NA	12,281	NA	NA	NA	NA	NA	9.4	9.3
Wine (million bottles)	131	262	NA	NA	NA	NA	334	NA	NA	NA	NA	NA	14.9	5.0
Confectioneries (thousand tons)	2,315	2,896	NA	NA	NA	NA	3,500	NA	NA	NA	NA	NA	4.6	3.9

[1] All rubles refer to 1967 prices. Data for 1970 through 1975 taken from N. Baibakov, "Gosudarstvenniy pyatiletniy plan razvitiya narodnogo khozyaystva SSSR na 1971–75 gody."
[2] G-R estimate.
[3] Excluding kolkhoz timber.
[4] From sugar beets only.
[5] From state resources only.
[6] Excluding brynza.

INTERINDUSTRY STRUCTURE OF THE SOVIET ECONOMY: 1959 AND 1966

By VLADIMIR G. TREML, BARRY L. KOSTINSKY, *and* DIMITRI M. GALLIK

CONTENTS

I. INTRODUCTION

The purpose of this paper is to present the Soviet ex post input-output tables for 1959 and 1966 in a comparable format and to provide the necessary methodological, classificational, and explanatory notes. The advances made in input-output techniques in the U.S.S.R. and in their application will be discussed only as a background necessary to place the two tables in proper perspective.

It must be noted at the outset that the impressive progress made by Soviet specialists both in the development of input-output theory and in the construction of various input-output tables and related models has not been matched by release of data in openly available literature. Although relatively large blocks of input-output data have been published, no detailed and complete tables have been made available. The published descriptive, classificational, and explanatory material, with important omissions and ambiguities, also leaves much to be desired. In brief, neither the data nor the descriptive material published for the 1959 and 1966 tables are directly usable without extensive evaluation and estimation to fill in the gaps.

The authors of this paper have thus had two tasks—to collect, collate, and interpret the available descriptive material and then to "reconstruct" the tables themselves, i.e., to construct complete three-

quadrant tables using all available Soviet input-output and related data.

A note must be added on references to Soviet sources in this paper. The Soviet literature on the theoretical aspects of input-output analysis and on empirical work in this area now numbers some 700 titles.[1] To this one must add probably an equal number of monographs, books, and papers on related subjects, such as Soviet national income accounting, industrial output, foreign trade, and the like. Even when dealing with a narrowly defined issue such as a single economic parameter, the researcher must consult numerous Soviet sources and interpret the results. This paper, which is essentially a summary of a number of studies—published and unpublished—by the authors, would be overburdened with references if all the original Soviet sources were cited. Under the circumstances, therefore, only the most useful and important ones will be noted.

II. Development of Input-Output Analysis in the U.S.S.R.

Many Western analysts early perceived input-output techniques as eminently suitable for a centrally planned economy, but this recognition was late in coming in the U.S.S.R. This refusal to explore the possibilities of input-output analysis, linear programming, and other new quantitative techniques being developed in the West can be explained by a general anti-mathematical bias on the part of much of the Soviet economic profession and particularly of the party ideologists. In the late 1950's, however, several important factors contributed to a marked change in attitudes toward what earlier were considered "bourgeois" analytical tools. The more pragmatic government of Khrushchev frankly admitted the shortcomings and defects of the Stalinist "command economy" and began an intensive search for more sophisticated planning and administrative techniques. The economy itself was becoming more complex with growing interdependencies among its various components that required major improvements in management. Possibly the most important factor was the rapid emancipation of the economic and statistical professions from the restraints of Stalinism. In the more relaxed atmosphere of the late 1950's the economists became both vocal critics of the inefficiencies of the Soviet economic system and energetic proponents of reform. A rapidly growing group of younger economists, inspired by some "old-timers" such as Nemchinov, Kantorovich, and Novozhilov, began to learn and apply mathematical and econometric techniques, closing the gap of some 20–30 years in a remarkably short time.[2]

The first two large-scale Soviet input-output tables, reflecting the economic transactions of 1959, were completed in 1960. One showed the production and distribution of 157 commodities measured in physical units. The second one, which became the basis for numerous studies and subsequent tables, was a traditional Leontief-type ex post table showing 83 endogenous producing sectors with flows measured

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[1] For standard bibliographies on Soviet input-output, see Treml, *Input-Output*, 1973; United Nations, *Input-Output*, 1972; —, *Input-Output*, 1967; —, *Input-Output*, 1964; and Taskier, *Input-Output*, 1961.

[2] Judy, "The Economists," 1971, pp. 209–251; Zauberman, "The Rapprochement," 1969, pp. 1–21; and Leontief, "The Decline," 1960, pp. 261–272.

in current, i.e., 1959, purchasers' prices. This table was later supplemented by employment data for each of the 83 sectors, measured in both man-years and man-hours, and by a capital matrix showing the distribution of 130 types of fixed productive capital assets used in the 83 sectors.[3]

After the successful completion of the first two tables, input-output techniques began to gain acceptance at a remarkably rapid pace. More and more Soviet economists and statisticians working at a growing number of institutions and organizations concentrated their attention on theoretical and applied problems of input-output analysis. New variants of input-output tables began to appear. Convinced of the importance of regional differentials in material, labor, and capital input coefficients, Academician Nemchinov led a group of researchers in exploring the various aspects of regional and interregional tables. Experimentation with planning input-output tables, i.e., static tables prepared on the basis of projected input coefficients, also was undertaken.[4]

Even a brief summary and a list of input-output tables prepared in the U.S.S.R. since 1960 would be too long for this paper. Suffice it to say that after the completion of the first two tables for 1959 and through 1966 various Soviet agencies and organizations prepared 9 national planning tables, 13 regional planning tables, and 22 regional ex post tables.[5]

In 1966, the most ambitious project to date was launched: construction of national ex post tables for 1966 in physical units (237 commodities) and in value terms (110 sectors). The table in value terms was supplemented by employment and capital data. A novel aspect of the project was the simultaneous construction of input-output tables in value terms for all 15 of the U.S.S.R.'s constituent republics, following the same methodology and classification as the national table. The national tables were completed in 1968,[6] and 12 of the republics have completed their tables. At the present time, construction of ex post input-output tables for 1972, both national and republic, is under way.

The record is quite impressive. Leaving aside for the moment the question of the quality of Soviet input-output data, it can be said that in terms of number of tables and quantity of independent input-output statistics (i.e., data that would otherwise have not been available) the Soviet Union probably ranks first in the world. The preparation of these tables represents an investment of funds and specialists which testifies to the government's commitment to input-output techniques;

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[3] The ex post tables in value terms are the only ones for which fairly extensive amounts of data have been published. In the case of the 1959 table a large block of transactions data from the first quadrant was published in *Nar. khoz. 60,* pp. 103–151. Some sectors, such as radioelectronics and other machinery, were completely omitted from the published data, and some, such as ferrous and nonferrous metallurgy, were lumped together. No data on outputs or value-added have been released. But all the omissions notwithstanding, the amount of data released for the 1959 ex post table is greater than for any other national table. Labor and capital matrixes, with similar omissions and aggregations, have been published, as have data on private and public consumption for the sectors in the flow table.

[4] Treml, "Input-Output," 1967, pp. 68–146.

[5] Treml, Gallik, Kostinsky, and Kruger, *The Structure,* 1972, pp. 12–15. Most of the regional tables included in this count are for republics. Recent evidence indicates that many tables covering smaller economic regions have been prepared or are nearing completion (see Abalakova and Razumovskaya, "Plenary," 1972, pp. 464–468).

[6] The data for the 1966 national ex post table were published in *Nar. khoz. 67,* pp. 63–117, in a format similar to that in which the 1959 data were published—a truncated version of the transactions matrix with some omissions and some aggregations, and nothing on output, final demand, or value added.

this is particularly true since as a rule Soviet input-output tables are more time-consuming and costlier than in the case of Western countries with better organized statistical systems.[7]

The haphazard nature of the Soviet price system, with highly differentiated taxes and numerous subsidies built into the values of the transactions, makes all Soviet value data rather inaccurate. However, in many other respects Soviet input-output tables are superior to typical Western tables. They contain a greater degree of detail in the final-demand and value-added quadrants, and they are supplemented by capital and labor matrixes, which are generally lacking in Western tables. Despite being newcomers to the field, Soviet input-output specialists have also managed to complete their tables faster than their Western counterparts. The 1959 and 1966 Soviet tables were ready in about 2 years, while typically it takes up to 6 years to complete an ex post table in Western countries.

At first glance, however, it appears that the effort devoted to the construction of input-output tables in the U.S.S.R. is not commensurate with their utility to the State. True, the input-output tables, particularly the 1959 and 1966 tables in value terms, have been used for a variety of purposes: calculation and manipulation of prices, analysis of the production functions of specific industries, studies of different elements in value added, projections of the most effective structure of capital investment, analysis of the labor and capital intensity of different products, measurement of the "full cost" of exports and imports, structural analysis of the economy as a whole, and so forth. However, with few exceptions these studies appear to have remained on the periphery of the Soviet administrative, planning, and management system, and there is little evidence that any of the results were linked directly to the decision-making process.

From the very beginning, input-output analysis was viewed as the most promising technique to first supplement and then replace entirely the traditional methods of planning.[8] However, contrary to the expectations of its proponents, direct use of input-output in Soviet planning has been anything but successful. The so-called planning tables which followed the construction of the two 1959 tables were ultimately labeled experimental and were not used.

After the completion of the 1966 input-output tables in 1968, the Council of Ministers directed Gosplan (*Gosudarstvennyy planovyy komitet*—State Planning Committee) to use these tables in preparing the draft of the 1971–75 State plan,[9] and this directive was reflected in the official planning methodology published by Gosplan in 1969.[10] Numerous statements have also been found to the effect that input-

[7] It came as a surprise to both Soviet statisticians and Western observers when it was discovered that despite its massive program of collecting and processing of industrial statistics, the Central Statistical Administration (TsSU) did not have the data necessary for the construction of input-output tables. Thus, in both 1959 and 1966 extensive and expensive sampling surveys had to be resorted to. The data for the final-demand and value-added quadrants also could not be taken directly from the regular census statistics, and thus, involved and elaborate recalculations were necessary. See Eydel'man, *Mezhotraslevoy*, 1966, pp. 85–184.

[8] V. D. Belkin, one of the early proponents of input-output and mathematical techniques, reported at a 1961 conference on a plan prepared by an institute of the Academy of Sciences to introduce input-output into the Soviet planning system. According to this plan, complete integration of input-output techniques with planning was targeted for 1965. Belkin, "A Plan," 1961, p. 134.

[9] "In the U.S.S.R.," 1968, p. 84.

[10] Gosplan SSSR, *Metodicheskiye*, 1969, pp. 574–609.

output data were used in drafting the 1971–75 plan but there is no description of how this was done. The most specific reference is found in a paper by a prominent Soviet statistician and TsSU (*Tsentral'noye statisticheskoye upravleniye*—Central Statistical Administration) functionary, A. Ya. Boyarskiy, who stated that "the preparation of the 1971–1975 draft plan can be considered as the beginning of practical utilization of input-output tables in planning," and that the data from the 1966 table were used in solving some price formation problems and systems of labor remuneration as well as in elaboration of a number of technical-economic problems.[11] However, all these instructions and references notwithstanding, it does not appear that input-output techniques have yet been integrated with other tools of central planning. In a recent book, three leading Soviet mathematical economists have complained that mathematical techniques, and particularly input-output analysis, have not become an integral part of the planning system; that Gosplan assigns studies involving mathematical methods to outside agencies, whereas its own planning staff continues to prepare plans in accordance with long established methods; and that input-output studies are conducted in the Economic Research Institute or the Main Computer Center of Gosplan and not in Gosplan itself.[12] An unsigned lead article in Gosplan's official journal (such articles usually imply policy statements by the top officials of Gosplan) also stated that, in fact, input-output techniques have not been used directly in actual planning.[13] Part of the explanation for the failure to integrate input-output techniques into the mechanism of planning lies in the resistance to change on the part of Gosplan, Gossnab (*Gosudarstvennyy komitet po material'no-tekhnicheskomu snabzheniyu*—State Committee for Supply), and other agencies.[14] It would, however, be misleading to place the entire blame on the bureaucratic planners' preference for the status quo.

Given the basic principles of Soviet planning it is clear that input-output tables and techniques, no matter how promising in some respects, do not quite fit into existing planning methods. In the first place, input-output tables are prepared in terms of commodities rather than administratively defined establishments and ministries. Part of the preparation of a Soviet input-output table is a time consuming adjustment of all transactions data from the "establishment" to the "commodity" basis; this involves the removal of all products from sectors for which these products are secondary or "nonsectoral" and their addition to their "parent" sectors or those sectors where the production of these products predominates. The extent of such "nonsectoral" production is considerable; in the 1966 ex post table every one of the 95 industrial sectors produced anywhere from 3 to 54 nonsectoral products that had to be reallocated, and 10 percent of the gross value of industrial output had to be removed and reallocated.[15] Thus, the commodity-establishment adjustment is both methodologically necessary and quantitatively important. However, although this adjustment makes an input-output table a more meaningful analytical

[11] Boyarskiy and Simakova, "The Regression," p. 49.
[12] Aganbegyan et al., *Sistema*, 1972, p. 67.
[13] "Planning," 1971, p. 9.
[14] The low esteem in which input-output techniques are held by Gossnab officials is well documented in Schroeder, "The 'Reform'" 1972, p. 100.
[15] Fidler, "Toward," 1969, pp. 36–37.

tool, it also reduces the table's usefulness to planning officials who must deal with enterprises and ministries as they exist with their multicommodity output mix.

A second problem is related to the Soviet planners' preference for using physical rather than value measures in constructing the plan. The input-output tables in physical units constructed to date, whether of the ex post or planning (ex ante) variety, have many shortcomings: they do not cover the entire range of commodities produced or all of the industrial output; the final-demand quadrant—so important for planners—is far less detailed than in tables in value terms. Although the need for constructing two input-output tables, one in physical units and one in value terms, that are identical in format, commodity classification, and definition of flows has been stressed since the early sixties, the Soviet econometricians have not yet succeeded in this task.[16]

Perhaps an even more serious problem is the fact that a static input-output table, i.e., a table that pertains to a given time period and where labor, capital, and technology are treated as exogenously determined parameters, has major limitations for planning purposes. In the last 5 years or so Soviet specialists have been working on dynamic input-output tables with particular emphasis on linking the capital investment flows of period t to the productive capacity of period $t+1$. Probably the most advanced such model is presently being tested at the Economic Research Institute of Gosplan,[17] but apparently it is as far removed from the actual planning processes as are the ex post static tables.

There are numerous other problems that reduce the usefulness of input-output tables for planning purposes: the use of current purchasers' prices in input-output tables while planning is done in constant producers' prices; the problem of disaggregation, i.e., of going from an input-output table which can at best show several hundred products to the several thousand products for which detailed plans are prepared; and many others too technical to discuss in this paper.[18] However, the failure to incorporate input-output techniques with planning has apparently not dampened the enthusiasm of the proponents of input-output analysis in the U.S.S.R., nor is there any evidence that the government has any doubt as to the ultimate utility of the new methods.[19]

Theoretical work is being continued and even expanded, and the number of econometricians, planners, economists, and statisticians addressing themselves to specific theoretical and applied problems related to input-output analysis is growing, with the Institute of Economics and Organization of Industrial Production of the Siberian Division of the Academy of Sciences U.S.S.R., the Central Statistical Administration of the U.S.S.R. and its affiliates in the republics, and

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[16] A combination value-physical input-output table for some 260 commodities for the years 1971–75 is currently being prepared by various Gosplan affiliates (Kossov, "Introduction," 1971, p. 330). If successful, such a table would undoubtedly greatly facilitate the adoption of input-output techniques in planning.

[17] Klotsvog and Novichkov, "The Use," 1971, p. 106.

[18] For an excellent and comprehensive discussion of the problems and successes of implementing traditional planning methods with input-output techniques see Ellman, *Soviet*, 1971, pp. 74–88 and 106–112.

[19] At a symposium on Soviet statistics 20 years hence, several speakers, including the director of the TsSU, V. Starovskiy, and his deputy, M. Eydel'man, predicted that in 20 years input-output techniques and models would dominate the field of national economic statistics (Vasil'yev, "Symposium," 1968, pp. 66–77).

the Economic Research Institute of Gosplan U.S.S.R. serving as centers for numerous projects. Input-output models and input-output techniques are now interjected into the discussion and analysis of an ever-widening range of problems: foreign trade, long-term projections, price formation, banking, and others. Time and space limitations preclude a detailed assessment of Soviet theoretical advances in the area of input-output analysis and related techniques. Western specialists seem to agree that the post-war Soviet "school" of mathematical economics has yet to produce anything new or particularly exciting, and that by and large the advances made can be described as catching up with the state of the art in Western econometrics.[20] Nonetheless, viewed against the state of Soviet economic theory in the late fifties, the progress over the last 12 years or so has been impressive indeed.

There appears to be a number of reasons for the apparently widespread support of input-output analysis in the U.S.S.R. First of all, input-output tables provide a rich source of economic statistics that are otherwise not available. Furthermore, these statistics are well-defined, are processed in accordance with a standard methodology, and present an internal consistency that is often lacking in general Soviet economic statistics. In some areas input-output data have opened completely new avenues of research and analysis. For example, until the appearance of input-output tables, analysis of personal consumption was perforce restricted to the use of published retail trade data, which fall far short of encompassing all personal consumption. Or, to give another example, for an economist studying the structure of fixed capital, the standard statistical handbooks offer rather meager information—a single value for total industrial capital and the percentage distribution of this total among some 25 industries. By comparison, the 1966 input-output table gives value data on fixed capital broken down by 110 sectors and 30 types of assets.[21]

The support for the input-output approach can also be explained by another factor that is more difficult to define but that may be even more important. Input-output analysis, in conjunction with other modern techniques such as linear programming, has acted as a sort of catalyst in the slow and difficult process of transforming the Soviet "command economy" into a more rational and efficient system of economic planning and administration. It appears to have become one of the primary vehicles for moving the economic and statistical professions from the doldrums of the Stalinist past with its paucity of coherent economic statistics and its haphazard methodology of dogma-controlled analysis. General equilibrium analysis, or any notion of overall balancing of the economic system, was banned in Soviet theoretical and applied economics after Stalin's condemnation of it in the early thirties. Thus, in a sense the acceptance of input-output analysis

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[20] This is also the opinion of Professor Clopper Almon as expressed in a paper on Soviet input-output presented at the annual convention of the Southern Economic Association in November 1972, and of Professor Richard Judy in a paper on Soviet computers and model building read at the annual convention of the American Economic Association in December 1972.

[21] The many regional tables are also of considerable utility in respect to providing analysts with data that are significantly better or otherwise unavailable. Most of the regional and republican statistical handbooks published in the U.S.S.R. offer less coverage and less detail. For some examples of the utilization of regional input-output data, see Ellman, *Soviet*, 1971, pp. 107–108.

represents a return to the mainstream of contemporary economic thought.

Input-output tables viewed as models of the national economy have been instrumental in posing a number of issues which challenged the traditional "dogmatic" economics of the Soviet past. One such issue of great significance to Soviet economic thinking is the starting point in planning. The traditional method called for planning the gross outputs of various branches, with national income being relegated to a relatively minor position in the plan. Input-output techniques stimulated thinking along the lines of planning a feasible (in terms of real constraints) mix of final product, or national income, the magnitudes of which become the determinants of the gross output targets. The nebulous dichotomy of the Marxian producer and consumer goods categories, the equilibrating role of prices, the notion of scarcity-dictated "trade-offs" of final goods and services, the misallocative effects of turnover taxes differentiated by products and consumers, and many other issues have been surfaced in the general frame of reference of input-output techniques, which thus have become an educational tool in the process of transforming the Soviet economic system into a more efficient one.

Despite the setbacks experienced by the so-called Kosygin reforms of 1965, the reform movement in the U.S.S.R. is by no means dead, and, as in the past, Soviet economists, particularly the mathematically-oriented economists, are among the most vocal advocates of change. To them, the blame for the failure in integrating input-output techniques with the traditional tools of planning lies squarely on the planning agencies. Thus, when the dean of Soviet mathematical economists and scientific secretary of the Economic Division of the Academy of Sciences U.S.S.R. Academician N. P. Fedorenko, recently stressed the "need for a most serious restructuring (*"perestroyka"*) of Gosplan and other planning agencies" in a major book on planing, he was speaking for the majority of Soviet economists.[22] As these reforms and changes in planning and administrative methods are implemented, input-output techniques—judging from the enthusiastic support given to them by the economic profession—will move from the periphery to a more prominent place in economic analysis and control.

III. The Reconstructed 1959 and 1966 Tables

As noted above, both the 1959 and 1966 Soviet ex post input-output tables in value terms are of the conventional static, open, Leontief type. The basic flow tables are composed of three principal quadrants: a square matrix of so-called interindustry transactions, which depicts the commodity flows among all the producing sectors in the economy;[23] a final-demand quadrant, which shows the distribution of output among various categories of "final" or end users; and a value-added quadrant, which shows depreciation and factor payments (labor income, profits, taxes) originating in each of the producing sectors. The flows in these tables are measured in current purchasers' prices of the

[22] Fedorenko. *Problemy*, 1972, p. 33.

[23] Conventionally, the format of the interindustry quadrant is used to designate the size of the entire table, regardless of the format of either of the other two quadrants. Thus, the flow tables presented with this study are usually referred to as 55-sector tables.

respective years, i.e., the prices paid by the purchasers of the products, including transportation and distribution charges and excise (turnover) taxes when applicable, as well as producers' costs and profits.

Soviet input-output tables conform to the material product definition of national income adhered to in the U.S.S.R. Thus, only those activities that are related to the production of material goods are represented in the interindustry quadrant. With few exceptions, all services are considered "nonproductive" and are reflected only in the final-demand quadrant as claimants against end output. However, a few service activities—freight transportation, communications serving production, various trade and distribution activities, and equipment repair services—are deemed to add to the value of material goods and are shown in the interindustry quadrant.

Since all transactions in the tables are given in terms of purchasers' prices, which include transportation and distribution costs, the entire output of the transportation and trade sectors is distributed within the interindustry quadrant and the entries for these sectors in the final-demand quadrant are zero. On the other hand, all construction activities are by definition considered as contributing only to the investment category of final demand, and the first-quadrant entries for the construction sector are all zero.

The sectors in Soviet input-output tables are supposed to be "pure," i.e., each sector reflects the production of only those commodities that come within its defined scope. Since in practice the enterprises included in any given sector usually also produce some output that by definition belongs in some other sector, the data in both the rows and columns of the tables (outputs and inputs) have been adjusted to reflect only the proper activities of each sector.[24]

The treatment of foreign trade in Soviet input-output tables is also different from that in their Western counterparts. Exports are given in the conventional manner as a column in the final-demand quadrant. Imports, however, are not separated into competing and noncompeting categories or into imports used in production and imports going directly into final demand, as is done in the United States and some other countries. Instead, all imports are treated as competing and are shown as a single row in the third quadrant, i.e., as if they were purchased by the industry producing the same products domestically and were distributed with that industry's output; no imports are shown separately in final demand. In the reconstructed 1959 and 1966 tables presented with this study, neither exports nor imports are separately identified (for lack of the proper data). They are incorporated in the "other final demand" column of the second quadrant as an export-import balance, i.e., exports minus imports.

Since neither the 1959 nor the 1966 table has ever been published in complete form, it has been necessary to "reconstruct" them from the published blocks of input-output data and other data from a wide variety of sources. The principal sets of data that have been published for each table are:

1. A truncated version of the interindustry quadrant, with some sectors omitted and others aggregated; [25]

[24] The problems and methods of this "commodity-establishment" adjustment are discussed in detail in Treml, Gallik, Kostinsky, and Kruger, *The Structure,* 1972, pp. 123–146.

[25] *Nar. khoz. 67,* pp. 63–111, and *Nar. khoz. 60,* pp. 103–143.

2. A small group of selected material input coefficients;[26]

3. A matrix of "embodied" labor corresponding to the published version of the interindustry quadrant and giving the interindustry flows in terms of man-years of labor;[27]

4. Some fixed capital stock data: capital-output coefficients only for the 1959 table,[28] and both coefficients and stock values for 1966;[29]

5. Private and public consumption by input-output sectors for 1959–1963.[30]

Space constraints make it impossible to describe all the details of the reconstruction in this paper. As an indication of the extent of the reconstruction process, for each table it was necessary to estimate some 600–700 entries, or about 20 percent of the total number in the table. A brief summary of the major steps in the reconstruction is all that can be given here.[31]

The most important element in the reconstruction process is the estimation of gross values of output (GVO) for individual sectors. It is primarily a lack of data for making some of these estimates that made it necessary to reduce the number of sectors in the reconstructed tables from the number in the original tables. Most of the GVO estimates were based on direct material or capital input coefficients and the corresponding ruble flow or stock value. Others were estimated by various methods, using both input-output and non-input-output data.

The next major step in the reconstruction was estimation of the flows omitted from the published version of the interindustry quadrant. This was accomplished by first constructing an aggregated 18-sector table representing major industry groups and estimating the flows between the omitted sectors and these groups. These values were then distributed among the disaggregated sectors according to the pattern of flows displayed by a published sector or combination of sectors that was chosen as a surrogate. Different alternative surrogate patterns were devised and tested for each of the omitted sectors.

In the final-demand quadrant, private and public consumption for the 1959 table were published, as noted above. For the 1966 table, these values were estimated by projecting the published 1959–63 data in conjunction with data on sales in retail trade. The third category in the final-demand quadrant ("other final demand") was calculated as a residual.

In the value-added quadrant, depreciation payments were estimated by applying rates published in various sources to the estimated or published values of capital stock in each sector. Wage payments were also derived by applying published wage rates to employment estimates. The third row in this quadrant ("other net income") is also a residual.

Employment was estimated by multiplying the GVO's by labor input coefficients calculated from the published labor flow and ruble

[26] *Nar. khoz. 67*, pp. 113–117, and *Nar. khoz. 60*, pp. 145–151.
[27] *Nar. khoz. 68*, pp. 73–121, and *Nar. khoz. 61*, pp. 77–117.
[28] "Fixed," 1966, pp. 87–95.
[29] *Nar. khoz. 69*, pp. 47–61, and *Nar. khoz. 68*, pp. 51–71.
[30] *Nar. khoz. 64*, pp. 579–585.
[31] The details of the reconstruction of the 1959 tables are given in Treml, *The 1959*, 1964; ———, "The 1959," 1966, pp. 257–270; and ———, Gallik, and Kostinsky, *The Reconstructed*, 1969. Those for the 1966 table are given in —, —, —, and Kruger, *The Structure*, 1972.

flow matrixes. Fixed capital values were published for the 1966 table; they were estimated for the 1959 table by applying published capital input coeffiicents to the GVO's.

Although condensed in comparison with the original Soviet tables, the reconstructed 1959 and 1966 tables presented in this paper are complete in that they encompass the entire economy, that is, each table comprehends all productive activities (Soviet definition) in the given year. The values in the tables are expressed in current purchasers' prices of the respective years. In each table the economy is divided into 55 comparably defined sectors. A set of three tables is provided for each year: (1) a three-quadrant table of transactions or flows, which depicts the interrelations among various segments of the economy; (2) a matrix of direct input coefficients derived from the flow table; and (3) a matrix of total (direct plus indirect) input coefficients. These tables are in the pocket on the inside back cover of this volume.

The first 55 rows and columns of each flow table represent producing sectors and comprise the interindustry quadrant. Row 56 gives the sum of the material purchases made by each sector, excluding transportation and communications and trade and distribution services. Row 57 includes the latter and shows the sum of all purchases.

Rows 58–61 comprise the value-added quadrant, showing depreciation, wages, other net income, and total national income, respectively, for each sector. The entries in the depreciation row represent payments made by producers to the State budget at fixed rates; these payments are supposed to reflect the wear and tear on fixed capital assets. The "wages" row reflects average wages and salaries paid in each sector. Other net income is a residual category incorporating other labor income (bonuses, agricultural income-in-kind), social security payments, profits, turnover taxes, and miscellaneous elements of net income. The row labelled "total national income" (61) is the sum of the "wages" and "other net income" rows. The last row (62) represents the total outlays of each of the producing sectors, and the values in this row are equal to the gross values of output of the producing sectors.

Column 56 gives the row sums of the first 55 columns and represents total interindustry deliveries of each of the producing sectors. Columns 57–60 constitute the final-demand quadrant, and show private consumption, public consumption, other final demand, and total final demand, in that order. Other final demand (column 59) is also a residual category and is composed of gross investment, losses, and the export-import balance (exports minus imports in domestic prices). Total final demand (column 60) is the sum of the three preceding categories. Finally, column 61 shows the gross value of output of each producing sector; the values in this column are equal to the total outlays of the sectors in row 62.

A brief description of the 55 producing sectors, in terms of the products or activities encompassed, is given in appendix A. Tables of employment and fixed capital stock data are given in appendix B. The employment table for each year gives average employment for the year in each sector (as defined in the input-output table) as measured in man-years, plus their derivative direct and total labor input coeffi-

cients. The capital table for each year shows the stock of fixed capital in each of the producing sectors, valued at initial cost in constant 1955 prices, again with their derivative direct and total capital input coefficients. The data for 1959 pertain to end-of-year values; those for 1966 are the average values for the year.

IV. Comparability of the Two Tables

The two Soviet input-output tables for the years 1959 and 1966 presented in this paper are comparable only in the limited sense of having the same number of rows and columns, an identical sector classification, and the same definitions of final-demand and value-added vectors.

The tables, of course, show the economic transactions of two different periods, reflecting different technologies and with the flows being measured in the prices of the respective years. And, as has been noted above, the flows of both tables are given in terms of purchasers' prices, i.e., prices that include transportation and distribution costs and turnover taxes where applicable—a feature which increases the degree of difference between prices of the two periods. In addition to changes in producers' prices the transactions recorded in the two tables also reflect changes in the output mix of the sectors and changes in transportation charges, distribution costs, and tax rates.[32]

In terms of overall accuracy the 1966 table is generally superior to the 1959 table. Comparison of the basic characteristics of the two tables clearly illustrates this—the original 1966 table has more producing sectors, more categories in final demand, and more in value-added (table 1).

TABLE 1.—COMPARISON OF THE ORIGINAL 1959 AND 1966 SOVIET INPUT-OUTPUT TABLES

Feature	1959	1966
Number of sectors in the 1st quadrant	83	110
Of which:		
Industry	73	95
Construction	1	5
Agriculture	2	2
Forestry	1	1
Trade and distribution	3	3
Transportation	1	2
Communications	1	1
Other material production	1	1
Columns in final demand	13	21
Rows in value added [1]	13	21
Density of 1st quadrant [2] (percent)	62	82
Prices used	[3] 1959	[3] 1966
Employment	([4])	([4])
Measurement	([5])	([5])
Fixed capital stock:		
Measurement	([6])	([6])
Types of capital	130	30

[1] Including the depreciation row.
[2] Estimated as the proportion of the total number of cells in the 1st quadrant which have nonzero entries.
[3] Current purchasers'.
[4] 1 row.
[5] Average man-years.
[6] Constant 1955 prices.

Source: Treml, Gallik, Kostinsky, and Kruger, The Structure, 1972, pp. 40–88.

[32] A pilot study comparing transportation and distribution costs in 1959 and 1966 indicates that significant changes occurred during this period. These changes are probably due less to changes in rates and more to changes in output mix and in geographic patterns of production and distribution.

The basic data for the 1966 table were also probably somewhat better. The data for both tables were obtained from specially conducted sample surveys. However, the 1966 surveys were more detailed and the number of enterprises sampled was larger; in addition to industry and construction, the 1966 surveys covered transportation, distribution services, and agriculture, which were not sampled in 1959.

The improvement in sampling techniques is reflected in the much higher density of the 1966 table, where the proportion of non-zero entries in the first quadrant is 82 percent of the total possible entries as compared with 62 percent in the 1959 table. Since the 1966 matrix is larger, it could have been expected, other things being equal, to have a lower density. The fact that the density increased indicates that the 1966 surveys succeeded in "catching" more and finer details than did those in 1959. Examination of the two tables in comparable format presented in this study reveals 673 entries in the 1966 table that were zero in 1959 and 409 of these are less than 100,000 rubles. Technological change is clearly not a sufficient explanation for this increase in density and for the appearance of these small flows.[33] However, even the improved sampling techniques employed in the construction of the 1966 table apparently did not ensure the desired level of accuracy, since in preparation for the 1972 table TsSU has decided to survey all enterprises in all industries, with the exception of some light, food, and construction materials industries that comprise a large number of small enterprises producing a relatively homogeneous output.[34]

The supplementary matrix of fixed capital accompanying the 1966 table also appears to be superior to that for 1959. The data used for the 1959 capital matrix were not collected specifically for the input-output table, but were derived from the inventory of fixed capital conducted as of January 1, 1960. In contrast, for the 1966 matrix special reporting forms were distributed to the enterprises; there is a much closer correspondence between types of capital assets and producing sectors; and the values are averages for the year, not end-of-year values as in the case of the 1959 matrix. Similarly, the depreciation data for 1966 are apparently better than those for 1959.

On the whole, the apparent data superiority of the 1966 table does not appear to be of such magnitude as to affect significantly the comparability of the two tables. Nor should the differences in the sectoral formats of the original tables have any important effect.[35] There are, however, several specific differences between the two tables that should be taken into account in some types of comparison studies.

One of the most important of these differences is a disproportionate increase in the values in the diagonal cells, or the intrasectoral trans-

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[33] In certain types of comparison tests it would probably be advisable to omit the positive 1966 entries that were zero in 1959 or to take this phenomenon into account in some other manner.

[34] Eydel'man, "The New," 1972, pp. 5–6.

[35] Aggregation of the comparable tables to a 55-sector format has eliminated all sectoral differences stemming from the different formats of the two original tables. There are, however, a few relatively minor shifts of specific types of products that still remain (see notes to appendix A).

actions, from 1959 to 1966. There is a general tendency in the U.S.S.R., noted by many analysts, both Soviet and Western, for intrasectoral transactions to increase at a more rapid rate than output in general. In some instances, this tendency is undoubtedly due to an increasing degree of specialization and branching-off subordinate units into independent enterprises. However, sector-by-sector analysis of the 1959 and 1966 tables shows that in the great majority of cases the intrasectoral entry increased a great deal more than did the gross output of the sector—in some cases by a factor of 10 or more. Such increases would appear to be too great to be explained by greater specialization alone, and they undoubtedly reflect changes in accounting practices that introduce an upward bias. Thus, in some comparisons it may be desirable to omit the intrasectoral entries.

Another important factor affecting the comparability of the tables is an apparent change in the definition of the sector called "repair of machinery and equipment." The formal definition, as given in the instructions issued to the reporting enterprises, is the same for both years and encompasses only the services performed by specialized repair enterprises. However, after the 1966 instructions were issued, the coverage of this sector was expanded to include also the capital repairs performed "in-house" by all enterprises. Thus, in the 1966 table the cost of "in-house" capital repairs was treated as a purchase from the repair sector, and the relevant values in the table were adjusted by the usual "commodity-establishment" adjustment procedure. In the 1959 table, however, they were left intact, and the repair sector reflected only the services performed by specialized enterprises.[38]

The problem of the repair sector also has another facet. The value of purchases from this sector by agriculture dropped drastically from 1,028 million rubles in 1959 to 512 million in 1966—a highly unusual change. The explanation for this probably lies in a reclassification of repair services purchased by kolkhozes from current account in 1959 to capital account in 1966. Such a change would move the value of such purchases from the interindustry quadrant to the final-demand quadrant.

As a result of these changes, the repair sector displays some rather erratic changes between 1959 and 1966. In this case, also, it is probably advisable to omit the repair sector in some types of comparison.

Despite all the discrepancies noted above, the Soviet tables for 1959 and 1966 retain a relatively high degree of comparability. Nor should they be singled out for criticism in respect to consistency. Because of data exigencies, most input-output tables for the same country in different years contain inconsistences in methodology and classification systems. In summary, the Soviet tables constructed to date are as good as, or perhaps even better than, other such tables, at least in respect to consistency over time.

[38] The inclusion of "in house" capital repairs in the repair sector of the 1966 table is reported in Eydel'man, "How," 1968, p. 52. The treatment of repair services in the 1959 table is less certain: the interpretation presented here is based in part on the original description of this sector and in part on comparison of the relevant data in the two tables.

Appendix A

DESCRIPTION OF THE 55 PRODUCING SECTORS

Sector number and title	Description	Corresponding sector numbers in original tables [1] 1959	1966
1. Ferrous ores and metals	Ferrous ores and nonmetallic raw materials for ferrous metallurgy; pig iron, steel, and ferroalloys; rolled ferrous plate, sheet, bars, beams, rails, and pipe.	1, 2	1, 2.
2. Nonferrous ores and metals	Nonferrous, rare, and precious metal ores; natural gems; nonferrous metals, alloys, and powders; semiconductor materials; carbon and graphite electrode products; chemical products of nonferrous metallurgy.	6, 7	6, 7.
3. Coke products and refractory materials.	Coke, coke oven gas, coal oil, coal tar, and other products of coke chemistry; refractory brick, powder, and other products from refractory materials.	3, 4	3, 4.
4. Industrial metal products	Steel wire, rod, tape, rope; wire nails, metal cloth, welding electrodes, chains, springs, screws, bolts, pins, rivets, keys, and other industrial metal products.	5	5.
5. Coal	Coal and lignite; coal briquets; raw liquid fuels from coal; other products of coal processing.	8, 14	8.
6. Oil extraction and refining	Crude oil and byproduct gas; refined fuels and lubricants; other products of oil refining (except carbon black).	9, 10	9, 10.
7. Gas	Natural and manufactured gas; natural gasoline; other products of gas processing.	11	11.
8. Peat and oil shales	Peat and peat briquets; oil shale and products of shale processing.	12, 13	12, 13.
9. Electric and thermal power	Generation and transmission of electric power and steam.	15	14.
10. Energy and power machinery and equipment.	Steam boilers and boiler equipment; steam, gas, and hydraulic turbines and equipment; nuclear power reactors; diesel engines (except auto, tractor, combine, and aircraft engines); steam engines; windmills.	16	15.
11. Electrotechnical machinery and equipment and cable products. [2]	Electric motors and generators; transformers, rectifiers, and condensers; high- and low-voltage apparatus; electrical transportation equipment; electric furnaces, electric welding equipment; lighting equipment, fixtures, and bulbs; X-ray apparatus; wet and dry batteries; electric insulating materials and products; electrical household appliances; all types of cable, including conducting wire, cord, and cable.	17, 18	16, 17.
12. Metalworking machinery and equipment.	All types of metalcutting and woodworking machine tools; sawmill frames; metal forging, pressing, stamping, and cutting machinery; molding and casting machinery and equipment.	20-22	20-22.
13. Tools and dies	Cutting tools, dies, chucks, jigs, and other fixtures for metalworking and woodworking machinery; measuring tools; mechanic's hand tools; pneumatic construction tools; electric tools; woodworking tools; chain saws.	23	23.
14. Precision instruments [3]	Electronic computers and data processing equipment; calculators; cash registers; office equipment; automatic control equipment; control, regulating, and measuring instruments (including scales); laboratory instruments; electrical and radio instruments; optical, astronomical, geodesical, meteorological, hydrological, geophysical, navigational, biological, and medical instruments; materials testing equipment; cameras, film projectors, and other photographic equipment; eyeglasses and other consumer optical devices; clocks and watches of all types.	24, 25	24
15. Mining and metallurgical machinery and equipment.	Iron and steel smelting and rolling equipment; coking equipment; equipment for nonferrous metallurgy; oil and gas drilling, extraction, and refining equipment; ore and coal mining and concentration machinery and equipment; peat mining equipment.	26	25-27.
16. Pumps and compressors [2]	All types of pumps and compressors, fans and ventilators; refrigeration equipment; oxygen and rare-gas apparatus; centrifuges, filter presses, autoclaves, mixing and drying drums, calenders, vulcanizers, heat exchangers, and other chemical equipment.	27	28, 29.

See footnotes at end of table.

DESCRIPTION OF THE 55 PRODUCING SECTORS—Continued

Sector number and title	Description	Corresponding sector numbers in original tables [1] 1959	1966
17. Specialized machinery and equipment.	Logging and lumbering equipment; pulp and papermaking equipment; equipment for the textile, chemical fiber, knitting, sewing, footwear, leather, fur, glass, and cable industries; household sewing machines; cotton ginning equipment; equipment for flour mills, grain elevators, and grain storage facilities; food processing equipment; printing presses, typesetting machinery, and other equipment for the printing industry; equipment for the production of lime, cement, prefabricated concrete, brick, insulating materials, and other construction materials.	28–31, 34	30–33, 36.
18. Hoisting-transporting and construction machinery and equipment.	Cranes, conveyors, elevators, escalators, hoists, winches, and other hoisting, loading, and materials handling machinery; dredges, excavators, bulldozers, graders, pile drivers, power rollers, and other machinery for construction and road building.	32, 33	34, 35.
19. Transportation machinery and equipment.[4]	Railroad, subway, and streetcar rolling stock and operating equipment; ships and boats of all types; horse-drawn vehicles.	35	37, 38.
20. Automobiles[4]	Trucks, passenger cars, autobuses, auto tractors and trailers; motorcycles, scooters, and bicycles; automobile, motorcycle and scooter engines and components.	36	39.
21. Tractors and agricultural machinery and equipment.	Tractors (including industrial and logging tractors); tractor and combine engines; all types of agricultural machinery and equipment.	37	40.
22. Bearings	All types of ball and roller bearings (including those made of plastic) and appurtenances.	38	41.
23. Other machine-building[3]	Radio communications apparatus and equipment; telephone and telegraph equipment; consumer radio and television receivers; electrovacuum and semiconductor devices; special materials and equipment for the electronic industry; medical, surgical, and dental tools and equipment; equipment for retail trade, public dining, hospitals, and sanatoriums; firefighting, safety, sanitation, laundry, and dry cleaning equipment; typewriters; castings, forgings, and stampings; parts and fittings in general machine-building use.	19, 39	18, 19, 42, 43.
24. Other metalworking	Heating and air-conditioning equipment; plumbing fixtures and fittings; cast iron sewer pipe; wood, coal, and gas stoves; metal building components; metal containers; shoemakers, chauffeur's, and gardener's tools; metal furniture parts; metal kitchen utensils, tableware, and cutlery; barbering tools; metal lamps and lanterns; metal sporting goods; knitting and sewing machine needles.	40, 41	44, 45.
25 Metal structures	Metal frames for buildings and structures; metal sheds; metal bridgework; utility poles and masts; water towers.	42	46.
26. Repair of machinery and equipment.[5]	All repair of machinery, equipment, and instruments, including consumer appliances, performed in specialized enterprises.	43	47.
27. Abrasives	Abrasive powders, pastes, and tools; synthetic diamonds; mica and graphite products (except pencils and electrodes).	44	48.
28. Mineral chemistry products	Extraction and concentration of apatite, phosphorite, natural potassium salts, native sulfur and boron, mineral pigments, and other mineral materials for chemistry.	45	49.
29. Basic and other chemistry products.	Inorganic acids, salts, and compounds; mineral fertilizers; sorbents and catalyzers; compressed and condensed gases; pesticides, herbicides, and disinfectants; all kinds of synthetic rubber; synthetic and organic pharmaceuticals and medications; rubber medical supplies; photographic film and paper, other photochemical supplies; magnetic tape.	46, 50, 54	50, 54, 58, 59.
30. Aniline dye products	All types of organic and synthetic aniline dyes and pigments for natural and synthetic textiles and furs.	47	51.
31. Synthetic resins and plastics	All types of synthetic resin and plastic materials; plastic products (except plastic household articles listed under industry, n.e.c.).	48	52.

See footnotes at end of table.

DESCRIPTION OF THE 55 PRODUCING SECTORS—Continued

Sector number and title	Description	Corresponding sector numbers in original tables [1] 1959	1966
32. Synthetic fibers	Viscose, acetate, acrylic, polyvinyl, and other synthetic fibers.	49	53.
33. Organic synthetic products	Synthetic organic acids and alcohols; synthetic aliphatic products; synthetic detergents and cleaning agents; carbon black; chemical reagents.	51	55.
34. Paints and lacquers	Paints, lacquers, varnishes; mineral pigments; wax compounds; polishing pastes; brake fluid; household chemicals.	52	56.
35. Rubber and asbestos products	Rubber tires, hoses, belts, machine parts; rubberized fabrics; rubber toys, sporting goods, and other rubber consumer goods (except rubber footwear); asbestos fiber, cord, sheet, and other products (except asbestos-cement construction materials).	53	57.
36. Logging	Felling and hauling of timber; extraction of natural resins and tars; railraod ties; firewood.	55	60.
37. Woodworking	Lumber and plywood; wooden containers; wooden and woven furniture, including spring and soft mattresses; wooden household utensils, sporting goods, and other wooden consumer goods; matches; products of dry distillation of wood; resin and turpentine; wood chemistry products; furniture repair.	56–58, 60	61–64, 66.
38. Paper and pulp	Woodpulp and cellulose; paper and cardboard of all types.	59	65.
39. Construction materials	Cement; prefabricated concrete; block and brick; roofing and drainage tile; asbestos-cement and slate products; soft roofing materials; ceramic wall and floor tile and pipe; crushed stone, gravel, and sand; lime, gypsum, and other binding materials; plaster and products; insulation materials; linoleum and polymer wall and floor coverings.	61	67–73.
40. Glass and porcelain	Glass and glass products; fiberglass and glass wool; porcelain housewares, art goods, laboratory supplies, plumbing fixtures and fittings.	62	74.
41. Textiles	Cotton, silk, wool, and linen yarn, thread, cloth, and fabrics; hosiery products and knit goods; jute and hemp fiber, yarn, rope, and fabrics; fish nets; felt products; synthetic furs; umbrellas; textile notions and haberdashery.	63	75–80.
42. Other light industry products	Clothing and apparel; industrial sewn goods; natural and artificial leather and products; rubber, leather, and textile footwear; natural furs and products from natural and synthetic fur; tanning agents; bristle and brush products; shoe and garment repair.	64, 65	81, 82.
43. Fish products	Fishing and whaling; fresh and processed fish and seafood; fish flour and meal; other fish products.	66	83.
44. Meat and dairy products	Meat and meat products; glue and gelatin; powdered eggs; milk and milk products.	67, 68	84, 85.
45. Sugar	Refined and granulated sugar; refined molasses and syrup; pulp.	69	86.
46. Bread, flour, and confections	Flour and cereals; bread and bakery products; macaroni and related products; all types of confectionery products.	70, 71	87–89.
47. Other foods	Vegetable oils; margerine and mayonnaise; laundry soap and candles; canned, frozen, and processed fruits and vegetables; fruit juices and extracts; tobacco and products; cosmetics and perfumes; raw and refined alcohol; alcoholic and carbonated beverages; yeast; tea and coffee; table salt.	72	90–94.

See footnotes at end of table.

DESCRIPTION OF THE 55 PRODUCING SECTORS—Continued

Sector number and title	Description	Corresponding sector numbers in original tables [1] 1959	1966
48. Industry, not elsewhere classified.	Extraction and primary processing of asbestos, graphite, talc, kaolin, chalk, asphalt, mica, abrasives, industrial diamonds; plastic machine parts and building accessories; printing and bookbinding; musical instruments and appurtenances; games and toys (except rubber toys); wallpaper; pencils, pens, ink, and general office supplies; jewelry and art products; buttons; commercial laundering and dry cleaning; movie and still film printing and processing; water supply systems; feather and down products; processed animal feeds.	73	95.
49. Construction	Industrial, commercial, transportation, agricultural, and residential construction—new and maintenance; design and survey work for construction; drilling for gas and oil.	74	96–100.
50. Crops	All grain, vegetable, fruit, berry, technical (cotton, hemp, flax), and other field and horticultural crops.	75	101.
51. Animal husbandry	Livestock and poultry raising, apiculture, sericulture; unprocessed animal products (meat, raw milk, eggs, honey, raw wool, raw silk, raw hides, etc.); veterinary services.	76	102.
52. Forestry	Planting, care, and maintenance of forests	77	103.
53. Transportation and communications.	Freight transportation, including pipelines; communications serving production, including postal services.	78, 79	104–106.
54. Trade and distribution	Wholesale and retail trade, including public dining; supply and distribution services; procurement of agricultural products.	80–82	107–109.
55. Other branches of material production.	Collection of ferrous and nonferrous metal scrap; motion picture production; publishing; noncommercial hunting, fishing, and trapping; gathering of wild fruits, nuts, herbs, etc.	83	110.

[1] These numbers refer to the unpublished original tables: 83-order in 1959, and 110-order in 1966. The correspondence between these and various reconstructed versions of the two tables can be found in Treml, Gallik, Kostinsky, and Kruger, "The Structure," 1972, pp. 103–105, 557–562.

[2] In the 1959 table, electrical household refrigerators were included in the "electrotechincal machinery and equipment" sector (No. 11), while in the 1966 table they were incorporated into the "pumps and compressors" sector (No. 16).

[3] Phonographs (nonelectric) were moved from the "precision instruments" sector (No. 14) in 1959 to "other machine-building" (No. 23) in 1966.

[4] Trolley buses were moved from "transportation machinery and equipment" (No. 19) in 1959 to "automobiles" (No. 20) in 1966.

[5] The 1966 definition of the "repair" sector also includes capital repairs by nonspecialized enterprises (see text).

Note: All machine-building sectors include spare parts.

APPENDIX B

EMPLOYMENT AND CAPITAL DATA FOR THE 1959 AND 1966 INPUT-OUTPUT TABLES

TABLE B-1.—EMPLOYMENT, 1959

Sector number and title	Employment (in thousands of man-years)	Direct coefficient (in man-years per thousand rubles of gross output)	Total coefficient (in man-years per thousand rubles of final demand)
Total	76,545.7		
1. Ferrous ores and metals	808.3	0.1172	0.3421
2. Nonferrous ores and metals	430.5	.1021	.3467
3. Coke products and refractory materials	97.2	.0615	.4560
4. Industrial metal products	47.2	.0631	.3724
5. Coal	1,257.7	.1956	.4798
6. Oil extraction and refining	176.5	.0263	.2393
7. Gas	14.2	.0534	.1470
8. Peat and oil shales	238.2	.5157	.6890
9. Electric and thermal power	405.4	.1134	.3026
10. Energy and power machinery and equipment	132.0	.2122	.4039
11. Eltech machinery and equipment and cable products	387.8	.1463	.3982
12. Metalworking machinery and equipment	172.4	.2320	.4497
13. Tools and dies	75.1	.2980	.4644
14. Precision instruments	277.7	.1831	.2975
15. Mining and metallurgical machinery and equipment	292.8	.2085	.4283
16. Pumps and compressors	88.9	.1814	.4334
17. Specialized machinery and equipment	183.0	.1950	.3976
18. Hoist-trans and construction machinery and equipment	111.4	.1547	.4337
19. Transportation machinery and equipment	352.8	.1755	.3754
20. Automobiles	346.9	.1125	.2981
21. Tractors and agricultural machinery and equipment	425.3	.1750	.3600
22. Bearings	76.9	.3152	.4857
23. Other machine-building	577.8	.2302	.4124
24. Other metalworking	600.7	.2450	.4272
25. Metal structures	76.3	.1722	.4010
26. Repair of machinery and equipment	1,235.7	.3295	.5258
27. Abrasives	27.7	.2223	.4366
28. Mineral chemistry products	26.2	.2079	.4378
29. Basic and other chemistry products	226.8	.0878	.3891
30. Aniline dye products	18.7	.1169	.3672
31. Synthetic resins and plastics	32.7	.0979	.3707
32. Synthetic fibers	59.6	.1669	.3269
33. Organic synthetic products	124.2	.1262	.3063
34. Paints and lacquers	38.4	.0381	.2631
35. Rubber and asbestos products	104.2	.0521	.3120
36. Logging	1,537.9	.3272	.6002
37. Woodworking	1,265.3	.2073	.5787
38. Paper and pulp	146.6	.1157	.4545
39. Construction materials	1,623.2	.2222	.5736
40. Glass and porcelain	214.3	.2442	.4708
41. Textiles	1,656.6	.0708	.3457
42. Other light industry products	1,780.8	.1099	.4207
43. Fish products	346.4	.1361	.3787
44. Meat and dairy products	528.2	.0452	.9693
45. Sugar	155.8	.0271	.2992
46. Bread, flour, and confections	897.3	.0499	.4411
47. Other foods	520.2	.0276	.2558
48. Industry, not elsewhere classified	2,150.2	.2797	.4350
49. Construction	10,700.0	.3662	.6140
50. Crops	17,504.1	.6173	.7764
51. Animal husbandry	14,748.3	.6172	1.0203
52. Forestry	365.0	1.1431	1.2065
53. Transportation and communications	5,264.5	.4663	.5781
54. Trade and distribution	4,828.3	.4311	.4999
55. Other branches of material production	765.5	.2518	.3333

TABLE B-2.—FIXED CAPITAL, 1959

Sector number and title	Capital stock (in millions of rubles)	Direct coefficient (in rubles per ruble of gross output)	Total coefficient (in rubles per ruble of final demand)
Total	164,088.4		
1. Ferrous ores and metals	6,370.7	0.9241	2.1168
2. Nonferrous ores and metals	3,480.5	.8256	2.2529
3. Coke production and refractory materials	986.0	.6239	2.7989
4. Industrial metal products	486.1	.6502	2.3748
5. Coal	7,605.8	1.1827	2.5699
6. Oil extraction and refining	4,926.3	.7349	1.8345
7. Gas	588.8	2.2135	2.5604
8. Peat and oil shales	591.5	1.2806	2.1387
9. Electric and thermal power	10,611.4	2.9674	3.9161
10. Energy and power machinery and equipment	554.5	.8913	1.9781
11. Eltech machinery and equipment and cable products	855.7	.3229	1.6208
12. Metalworking machinery and equipment	643.4	.8659	1.9488
13. Tools and dies	107.2	.4254	1.3292
14. Precision instruments	398.2	.2625	.7100
15. Mining and metallurgical machinery and equipment	994.2	.7081	1.7793
16. Pumps and compressors	261.8	.5343	1.8656
17. Specialized machinery and equipment	374.4	.3988	1.3914
18. Hoist-trans and construction machinery and equipment	344.3	.4782	1.7546
19. Transportation machinery and equipment	1,422.9	.7079	1.5990
20. Automobiles	1,161.4	.3766	1.2421
21. Tractors and agricultural machinery and equipment	1,053.4	.4335	1.3120
22. Bearings	141.9	.5816	1.5622
23. Other machine-building	1,032.2	.4112	1.2238
24. Other metalworking	517.4	.2110	1.1220
25. Metal structures	147.1	.3321	1.7146
26. Repair of machinery and equipment	2,437.1	.6499	1.5418
27. Abrasives	93.8	.7528	1.8293
28. Mineral chemistry products	191.7	1.5214	2.7571
29. Basic and other chemistry products	1,318.5	.5107	2.0734
30. Aniline dye products	125.3	.7831	2.1229
31. Synthetic resins and plastics	164.0	.4910	1.7638
32. Synthetic fibers	291.0	.8151	1.6789
33. Organic synthetic products	1,055.8	1.0730	2.0768
34. Paints and lacquers	115.4	.1146	1.2095
35. Rubber and asbestos products	292.0	.1460	1.2697
36. Logging	2,086.8	.4440	1.5919
37. Woodworking	1,655.3	.2712	1.3633
38. Paper and pulp	878.4	.6933	1.8694
39. Construction materials	4,537.2	.6212	2.2853
40. Glass and porcelain	399.0	.4548	1.3520
41. Textiles	2,623.1	.1121	.6425
42. Other light industry products	1,025.9	.0633	.6644
43. Fish products	1,950.6	.7666	1.6461
44. Meat and dairy products	1,299.4	.1112	1.5527
45. Sugar	851.8	.1483	.7208
46. Bread, flour, and confections	2,400.0	.1335	.8700
47. Other foods	1,624.1	.0862	.5859
48. Industry, not elsewhere classified	6,811.8	.8860	1.3288
49. Construction	5,458.3	.1868	1.0975
50. Crops	22,751.7	.8023	1.2133
51. Animal husbandry	19,169.8	.8023	1.4985
52. Forestry	15.0	.0470	.2058
53. Transportation and communications	28,991.4	2.5679	3.1558
54. Trade and distribution	7,400.0	.6607	.9179
55. Other branches of material production	417.1	.1372	.4348

TABLE B-3.—EMPLOYMENT, 1966

Sector number and title	Employment (in thousands of man-years)	Direct coefficient (in man-years per thousand rubles of gross output)	Total coefficient (in man-years per thousand rubles of final demand)
Total	81,146.6		
1. Ferrous ores and metals	984.6	0.0806	0.2539
2. Nonferrous ores and metals	707.2	.0825	.2466
3. Coke products and refractory materials	104.6	.0575	.3226
4. Industrial metal products	111.2	.0925	.2704
5. Coal	1,189.0	.1767	.3774
6. Oil extraction and refining	208.0	.0205	.1610
7. Gas	20.9	.0128	.1524
8. Peat and oil shales	138.8	.2461	.3643
9. Electric and thermal power	615.7	.0818	.1960
10. Energy and power machinery and equipment	237.8	.1600	.3033
11. Eltech machinery and equipment and cable products	730.1	.1072	.2734
12. Metalworking machinery and equipment	241.6	.1969	.3241
13. Tools and dies	102.3	.1807	.3120
14. Precision instruments	502.9	.1809	.2753
15. Mining and metallurgical machinery and equipment	389.9	.1444	.2263
16. Pumps and compressors	203.1	.1128	.2620
17. Specialized machinery and equipment	227.8	.1582	.2923
18. Hoist-trans and construction machinery and equipment	194.0	.1061	.2720
19. Transportation machinery and equipment	418.2	.1101	.2834
20. Automobiles	540.8	.1008	.2597
21. Tractors and agricultural machinery and equipment	652.1	.1370	.3146
22. Bearings	114.0	.2080	.3507
23. Other machine-building	1,482.3	.1348	.3046
24. Other metalworking	634.3	.1475	.2780
25. Metal structures	96.4	.1405	.3107
26. Repair of machinery and equipment	2,001.4	.2433	.3630
27. Abrasives	55.0	.1467	.3048
28. Mineral chemistry products	56.8	.1343	.2603
29. Basic and other chemistry products	494.6	.0801	.2400
30. Aniline dye products	22.6	.0795	.2459
31. Synthetic resins and plastics	64.7	.0525	.2047
32. Synthetic fibers	107.4	.0933	.2416
33. Organic synthetic products	86.6	.0515	.1901
34. Paints and lacquers	46.8	.0326	.2212
35. Rubber and asbestos products	203.9	.0564	.2042
36. Logging	1,170.7	.2367	.4111
37. Woodworking	1,510.5	.1651	.4214
38. Paper and pulp	149.9	.0907	.3320
39. Construction materials	1,721.4	.1275	.3133
40. Glass and porcelain	284.5	.1624	.2679
41. Textiles	1,808.8	.0478	.2470
42. Other light industry products	2,181.8	.1120	.3189
43. Fish products	285.5	.0574	.2429
44. Meat and dairy products	634.8	.0269	.6657
45. Sugar	154.9	.0197	.2283
46. Bread, flour, and confections	808.7	.0418	.3312
47. Other foods	769.8	.0227	.1769
48. Industry, not elsewhere classified	769.9	.0652	.2943
49. Construction	11,580.0	.2671	.4290
50. Crops	15,623.8	.3418	.4293
51. Animal husbandry	14,769.9	.3924	.5924
52. Forestry	424.1	.9716	1.0316
53. Transportation and communications	4,565.0	.2403	.2908
54. Trade and distribution	7,090.2	.4390	.4860
55. Other branches of material production	855.0	.2639	.3594

TABLE B-4.—FIXED CAPITAL, 1966

Sector number and title	Capital stock (in millions of rubles)	Direct coefficient (in rubles per ruble of gross output)	Total coefficient (in rubles per ruble of final demand)
Total	298,080.0		
1. Ferrous ores and metals	12,125.5	.9923	2.4726
2. Nonferrous ores and metals	7,340.3	.8568	2.3494
3. Coke products and refractory materials	1,338.5	.7356	2.8685
4. Industrial metal products	589.3	.4903	2.0276
5. Coal	9,145.4	1.3591	2.8960
6. Oil extraction and refining	8,602.5	.8469	2.0533
7. Gas	803.1	.4927	1.7798
8. Peat and oil shales	840.1	1.4898	2.4377
9. Electric and thermal power	23,661.4	3.1434	4.0861
10. Energy and power machinery and equipment	976.6	.6572	1.7564
11. El tech machinery and equipment and cable products	2,213.4	.3251	1.5394
12. Metalworking machinery and equipment	962.3	.7842	1.6942
13. Tools and dies	290.6	.5134	1.5865
14. Precision instruments	1,007.3	.3623	.9554
15. Mining and metallurgical machinery and equipment	1,311.3	.4857	1.1534
16. Pumps and compressors	810.2	.4501	1.5044
17. Specialized machinery and equipment	839.5	.5831	1.5290
18. Hoist-trans and construction machinery and equipment	712.0	.3893	1.5176
19. Transportation machinery and equipment	2,050.5	.5396	1.6888
20. Automobiles	1,932.4	.3602	1.4626
21. Tractors and agricultural machinery and equipment	2,487.2	.5225	1.8133
22. Bearings	398.5	.7272	1.9310
23. Other machine-building	5,989.5	.5445	1.8330
24. Other metalworking	1,582.7	.3680	1.3510
25. Metal structures	505.5	.7370	2.3248
26. Repair of machinery and equipment	6,195.4	.7531	1.5461
27. Abrasives	188.2	.5020	1.6249
28. Mineral chemistry products	884.6	2.0913	3.2773
29. Basic and other chemistry products	5,129.6	.8303	2.1658
30. Aniline dye products	276.2	.9715	2.4898
31. Synthetic resins and plastics	551.7	.4478	1.7489
32. Synthetic fibers	1,091.0	.9479	2.2605
33. Organic synthetic products	1,184.7	.7043	2.0108
34. Paints and lacquers	217.0	.1511	1.4529
35. Rubber and asbestos products	883.9	.2445	1.4182
36. Logging	2,831.1	.5724	1.6065
37. Woodworking	3,835.4	.4193	1.6478
38. Paper and pulp	1,621.7	.9811	2.4156
39. Construction materials	9,894.7	.7329	2.3067
40. Glass and porcelain	750.2	.4282	1.1668
41. Textiles	4,153.9	.1097	.8026
42. Other light industry products	2,449.7	.1258	.8025
43. Fish products	3,255.2	.6544	1.8658
44. Meat and dairy products	2,683.4	.1139	1.7708
45. Sugar	1,646.5	.2094	.9225
46. Bread, flour, and confections	2,074.7	.1071	1.0102
47. Other foods	3,472.7	.1022	.6523
48. Industry, not elsewhere classified	13,959.9	1.1825	2.3734
49. Construction	11,838.0	.2730	1.3301
50. Crops	36,803.0	.8051	1.1863
51. Animal husbandry	30,307.0	.8052	1.4366
52. Forestry	24.7	.0566	.2702
53. Transportation and communications	41,444.0	2.1813	2.6425
54. Trade and distribution	19,382.0	1.2001	1.4736
55. Other branches of material production	534.3	.1649	.6592

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INDUSTRIAL PRODUCTION IN THE U.S.S.R.

By RUSH V. GREENSLADE *and* WADE E. ROBERTSON [1]

CONTENTS

I. INTRODUCTION

Indexes of industrial production are compiled using time series on quantity of production, and value-added weights and prices for a designated base year. Periodically, therefore, these indexes should be revised to reflect changing production relationships and changes in prices. On 1 July 1967, the Soviet government instituted a sweeping and long overdue revision of prices. Substantial increases in fuel and raw material prices were adopted, along with moderate increases in most manufactured goods and construction, and large decreases in prices of a few categories such as electronics, computers, and precision instruments. As is generally the case in long run price trends, the prices of the fastest growing products were reduced the most, and those of the slowest growing were increased the most. These price changes call for revisions in the 1960-based component weights in various production indexes used in past JEC compendiums. The net effect of these changes is to reduce slightly the overall rate of growth of Soviet industrial production.

The purposes of this report are to (1) update the civilian industrial production index shown in previous JEC compendiums, (2) revise the weights to a 1968 price basis, and (3) discuss recent trends in the branches of industry.

[1] The authors are indebted to Robert A. Dockstader and Kurt W. Krueger for their significant contributions to this study. The authors, of course, assume full responsibility for any errors.

II. The Index of Civilian Industrial Production With 1968 Weights

The revised indexes of Soviet civilian industrial production by branch and by year for 1951–1972 are shown in Appendix A. Rates of growth for industry and its branches by five-year periods are shown in Table 1. The overall rates of growth for five-year periods for the present index in 1968 weights and earlier indexes with 1960 value-added weights are shown in Table 2.

TABLE 1.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF CIVILIAN INDUSTRIAL PRODUCTION, BY BRANCH, 1951–72[1]

[In percent]

Branch of industry	1951–55	1956–60	1961–65	1966–70	1971[2]	1972[2]
Industrial materials	10.3	9.0	7.1	6.0	5.5	5.1
Electric power	13.1	11.5	11.5	7.9	8.1	7.4
Coal products	8.4	6.0	2.8	2.0	2.5	2.2
Petroleum products and gas	11.5	15.4	9.9	7.8	6.9	5.7
Ferrous metals	11.6	8.1	7.9	5.5	4.1	3.9
Nonferrous metals	12.4	7.4	8.3	8.6	5.7	7.0
Forest products	7.2	6.1	3.0	3.5	3.8	3.8
Paper and paperboard	9.9	6.5	7.8	7.2	5.6	4.6
Construction materials	16.2	17.0	7.2	6.1	5.7	5.3
Chemicals	11.5	9.4	12.1	9.0	7.9	6.6
Civilian machinery	12.1	11.3	9.3	9.1	10.1	8.1
Producer durables	10.4	12.0	9.3	7.9	9.5	7.7
Consumer durables	23.0	7.7	9.0	15.0	12.4	10.0
Consumer nondurable goods	10.5	7.0	4.5	6.4	3.8	1.5
Softs goods	11.2	7.0	2.4	8.0	4.5	1.3
Processed foods	9.6	6.9	7.0	4.7	2.9	2.2
Civilian industrial production	10.7	8.9	6.9	6.8	6.2	5.0

[1] The base year for the calculation shown in each column is the year before the stated initial year of the period; i.e., the average annual rate of increase for 1951–55 is computed by relating production in 1955 to the base year 1950. Computed from unrounded data.
[2] Preliminary.

The revisions in this index, as compared with past indexes in JEC publications are:

(1) The substitution of 1968 value-added weights in place of 1960 weights for the branches of industry.

(2) The substitution of 1 July 1967 or later prices for 1955/56 prices as weights for individual products, where possible. This revision is incomplete because of the scarcity of price data, especially in the machinery branches. However, machinery and equipment groups which are represented by Soviet value of output series are in 1 July 1967 prices. The most important of these is the heavily weighted and fast growing series on precision instruments whose average price level was reduced by 31 percent.

(3) The substitution of the official value of output series "goods of cultural everyday life" for previous estimates of consumer durables.

(4) Substitution of the newly reported official value of output series on production of metalcutting and forge-press machine tools for the physical quantity series on metalcutting tools.

Trends in Overall Industrial Production

Civilian industrial production in the Soviet Union grew rapidly during the 1950's but slowed noticeably during the 1960's. This slow-

down is apparently continuing into the 1970's. The production of consumer durables, starting from a very low base in the early 1950's (and still accounting for only 11 percent of total machinery output) led all sectors in growth except for the late 1950's and early 1960's. The production of machinery for use by industry (producer durables) grew at rates substantially above that of industry as a whole after 1955. Industrial materials advanced at rates roughly comparable with total industry while the production of consumer nondurable goods generally lagged behind output advances in the other sectors.

TABLE 2.—U.S.S.R.: COMPARISON OF THE REVISED CIVILIAN INDEX WITH 1960 WEIGHTED INDEX

[In percent]

Base year weights	1951–55	1956–60	1961–65	1966–70	1971 [1]	1972 [2]
1960	10.9	9.2	6.8	7.0	(2)	(2)
1968	10.7	8.9	6.9	6.8	6.2	5.0

[1] Preliminary.
[2] Not available.

The slowdown in industrial output which began in the late 1960's, was evident in all sectors except consumer durables. The decline in average growth rates was most dramatic in producer durables and consumer nondurable goods. The largest contributors to the slowdown, however, were industrial materials and producer durables, which accounted for 65–75 percent of value-added in civilian industrial production. Many factors combined to produce this slowdown, but the sharp reallocations of industrial investment in the early 1960's to favor growth in chemicals, petrochemicals and electronics undoubtedly produced serious dislocations in industry. In addition, military production may have accelerated in this period as missiles and other advanced weapons entered into service at rapid rates.

The difficulties experienced by the Soviet economy in the early 1970's suggest a continuation of the long-term slowing of industrial growth, or even a second stage slowdown. The slowdown of the early sixties which leveled out through the late sixties represented a 30 percent drop in average growth from the fifties. Industrial growth in 1971 and 1972 averaged 5.6 percent, an 18 percent decline from the average of 6.8 percent for the 1960's. The seriousness of this retardation is evidenced in the scaled-down industrial goals set for 1973, and in the emphasis Soviet leaders place on finishing capital construction projects in 1973 before making major new starts, and in the redirecting of new starts to sectors which have lagged in introducing new capacity.

Inclusion of estimates of armaments production would undoubtedly change the growth rates for industry and for total machinery. The degree of the slowdown in industrial growth, for example, might be altered by inclusion of growth in armaments production which could account for 30 percent of total machinery production. The inclusion of military machinery, however, would probably not eliminate the slowdown since this phenomenon appears in all of the non-defense related components of the index except consumer durables as well as in the

official Soviet indexes of industrial growth which include production for defense purposes. It is likely that the inclusion of armaments would increase the rate of growth somewhat in the period 1951–55 and particularly in 1951–52 because of the Korean War. It is unlikely, however, that the addition of arms production would greatly change the basic trends in industrial production shown here for later periods.[2]

Significant Developments in Major Branches of Industry

INDUSTRIAL MATERIALS

The industrial materials sector showed an average annual growth of 9.7 percent during the 1950's, declining to 6.6 percent during the 1960's. During 1951–60, three branches in this sector—construction materials, electric power, and petroleum products and gas—boosted their output more rapidly than all other industrial branches except consumer durables. In the 1960's chemicals, electric power and petroleum products and gas led the way. In the latter 1960's chemicals and nonferrous metals were the fastest growing branches. Production of industrial materials held its own in 1971–72 with an average annual growth of 5.3 percent compared to 6.0 percent during 1966–70. Nevertheless, recent developments in several key branches—oil, gas, ferrous metals, and chemicals—have disturbed Soviet planners as none of these branches were ahead of their 1972 plan goals and indeed natural gas was significantly behind its plan goals.

CIVILIAN MACHINERY

Of the three major sectors of industry, civilian machinery had the highest rate of growth during 1951–72, and the vigor of its expansion has held up best. In 1961–65, the growth of producer durables decreased significantly relative to the last half of the fifties but there was a strong surge in consumer durables production. The continued acceleration in consumer durables has been fueled by changes in the structure of consumer durables. In the 1950's, kitchen utensils and small electrical appliances predominated; in the 1960's television sets, refrigerators, and washing machines, whose combined growth averaged 18 percent a year in 1966–70, came to dominate in value terms. Continued rapid growth of consumer durables, however, depends on Soviet investment priorities. If the decline in overall industrial growth continues, the Soviets may well place more stress on increasing the output of investment goods at the expense of consumer durables.

The production of producer durables decelerated after 1965. The slowdown was apparently caused by slower growth of equipment for the chemicals and electric power industries and agricultural equipment. At the same time, the structure of output has been changing to include acceleration of the production of technologically advanced products which will contribute to the modernization of plant and equipment throughout the industrial sector. This trend is evidenced by the emphasis on computers and numerically con-

[2] See R. V. Greenslade, "Industrial Production Statistics in the USSR", in *Soviet Economic Statistics*, V. Treml and J. Hardt, ed. (Duke University Press, Durham, N.C.), pp. 166–168, for a discussion of the probable effect of arms production on the industrial index.

trolled machine tools. In addition, passenger car production has become one of the fastest growing machinery items. While the producer durables branch was able to improve its growth in 1971 relative to 1966–70, its growth declined in 1972. 1972 output of turbines, generators, oilfield equipment, coal cleaning equipment, chemical equipment, and equipment for light industry was about 10 percent below original plan levels.

CONSUMER NONDURABLES

The average annual growth in consumer nondurable goods was about the same in 1951–55 as the growth in industrial materials and producer durables. Thereafter, growth in consumer nondurable goods slumped much more seriously than that of the others. The food and soft goods industries, which make up the consumer nondurables sector, are marked by fluctuating growth rates. The slowdown in the early 1960's was in the production of soft goods and reflects the dislocations stemming from abrupt policy changes of that period: investment resources were abruptly redirected to producer durables and industrial materials. The poor performance of consumer nondurable branches in 1963, 1969, and 1972, and in the years immediately following these points in time, can be explained in part by a shortage of raw materials caused by harvest failures. In light industry, changing consumer preferences have forced changes in the output mix that may have affected growth temporarily.

The poorest performance in 1971–72 was turned in by the food and soft goods branches of industry. From an average annual growth of 6.4 percent during 1966–70, consumer nondurables slowed to 3.8 percent in 1971 and 1.5 percent in 1972. Shortages of raw materials from the agricultural sector and lags in the introduction of new productive capacity in the food and soft goods industries were the main reasons for the slowdown.

III. Productivity in Industry

Industrial growth in the USSR has been chiefly fueled by large increases in human and material resources and less so by gains in productivity resulting from improved education and training of workers and the introduction of higher quality machinery. Between 1950 and 1972, the 8.0 percent average annual growth in industrial output was attributable to a 5.9 percent growth in labor and capital inputs combined with a 2.0 percent growth in productivity. In the 1950's, the relative importance of productivity elements was much greater than in later years as the Soviets reaped the benefits of a large backlog of unapplied technology in their own country and extensive borrowing of technology from abroad. The influences of these circumstances had begun to wane in the late 1950's and fell precipitously during the slowdown of the early 1960's.

Nearly all of the decline in industrial growth in the 1960's was the result of a decline in the growth of the efficiency with which labor and capital were used rather than a slower rate of growth of inputs of labor and capital. Although the rate of increase of fixed capital available to industry fell somewhat in the 1960's, compared with the

very high levels of the 1950's, this was offset by a substantially higher rate of growth of man-hours worked in industry, as the scheduled reduction in the length of the workweek had run its course by 1961.

The pick-up in productivity growth in the 1966–70 period almost exactly counter-balanced the decline in growth of inputs to sustain average Soviet civilian industrial growth at nearly 7 percent for this period. Although man-hour growth increased in the late 1960's, the growth of capital stock declined sharply from 11.2 to 8.7 percent (see Table 3). The rate of growth of investment remained about the same during this period but the retirement rate of industrial capital stock was increased in an effort to reduce the average age of capital stock.

TABLE 3.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF INDUSTRIAL PRODUCTION, FACTOR INPUTS, AND FACTOR PRODUCTIVITY, 1951–72

[In percent]

	1951–60	1961–65	1966–70	1971–72[1]
Civilian industrial production	9.8	6.9	6.8	5.6
Inputs:				
Labor (man-hours) and capital[2]	6.1	6.3	5.5	4.8
Man-hours	2.4	3.0	3.3	2.1
Capital	11.5	11.2	8.7	8.8
Factor productivity:				
Labor (man-hours) and capital	3.5	.5	1.2	.8
Man-hours	7.2	3.8	3.4	3.5
Capital	−1.5	−3.9	−1.8	−3.0

[1] 1971 and 1972 data are preliminary.
[2] Inputs have been combined using a Cobb-Douglas (linearly homogenous) production function with weights of 58.4 percent and 42.6 percent for labor and capital respectively.

Industrial productivity in 1971–72 fell to the 1961–65 level, when the near collapse of productivity growth proved to be a major stimulus for a subsequent economic reform. The reform of the industrial management structure introduced in April of this year, while not dealing with the critical issues of managerial and labor incentives, reorganized industrial enterprises, research institutes and design bureaus into larger units called production associations. One objective of these associations is to accelerate the rate of technological progress by bringing applied research-and-development facilities and production enterprises under one-man control. Premier Kosygin and other commentators have stated that an overall slowdown of the expansion of the labor force and a desire to funnel more workers into the service sector has lent special importance to improvement of labor productivity growth in industry.

IV. The Method of Construction of the Index

The index of Soviet civilian industrial production presented here is based on a sample of industrial products, aggregated into major branches which are weighted by value-added in a base year. The individual products are for the most part given in physical quantities, such as units or tons. These are aggregated into 13 major branches by use of wholesale prices. The value-added weights for the major branches are the sum of labor costs (wages and social insurance deductions) and capital costs (depreciation charges and an inputed interest charge on fixed and working capital). This procedure is analogous to that used in

the Federal Reserve Board index of industrial production for the US, except that the level of detail of the product sample and of the value-added weights is very much less in the index for the USSR.[3]

The 1968 value-added weights used in this index differ in several respects from those with earlier base years published in previous JEC compendiums. Value-added weights computed for the year 1955 were used in the first version of the index of Soviet civilian industrial production and they consisted only of estimated wages and depreciation. In subsequent compendiums, value-added weights calculated for the year 1960 utilized more complete data on employment and wages and included an imputed interest charge on capital. The current index has been aggregated using value-added weights for the year 1968 which reflect the 1967 price reform and incorporate the 1968 data on employment, wages and capital. The difference in the value-added weights for 1960 and 1968 are, however, relatively small (see Appendix Table A–1).

The price weights for individual products were 1955 prices for both the 1955 weighted index and the 1960 weighted index. For the 1968 weighted index an effort was made to use 1968 wholesale prices where available. Product price data for 1968 and later years are extremely scarce so that the revision of price weights is incomplete and based mostly on coefficients of price change of groups or classes of products that have been published by the Soviet government. The greatest impact of the 1968 price weights was in the machinery branch. This is discussed below.

The sample of products consists of 315 series and is limited to final products within each branch.[4] The primary constraint in choosing the sample is the availability of data.

The sample of physical production items is reasonably good for industrial materials and passable for consumer nondurables. However, the coverage of the physical series for machinery and equipment is very unrepresentative. In addition, the level of detail is usually inadequate to reflect new models and changing product mix. For a few categories of very heterogeneous types of machines the USSR publishes value of output series (e.g. value of all agricultural equipment) in rubles.[5] These series presumably provide a complete coverage of their respective groups. Where available, these series have been included in the machinery branch of the index.

An important change in the index in this paper, as compared to previously published indexes, is the substitution of the official Soviet value of output series for the previous series on consumer durables. The coverage of the Soviet value of output series is broader, including, for example, a number of household articles which are produced in the machinery sector but which were not included in the sample used in previous JEC publications. Furthermore, the older series on such consumer durables as refrigerators, washing machines, and sewing machines were not detailed by model and thus did not reflect changes in quality or complexity over time. The Soviet value of output series grows more slowly than the previous sample of consumer durables,

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[3] Most of the information for the product series and the estimation of the value-added weights were taken from the official Soviet statistical yearbooks (*Narodnoye Khozyaystvo* SSR, by year). The authors estimated a few product series, for example, the nonferrous metals.

[4] See R. V. Greenslade in Treml and Hardt, *op. cit.*, for a fuller discussion of the sample of products.

[5] See appendix B for a list of the ruble value series included in the index.

particularly during the 1950's, but the growth rates of the two series match better during the 1960's. The differences which do appear seem to be in the absence from the previous series of basic household articles such as pots and pans and tableware which during the 1950's did not grow as fast as the other products. These basic household articles probably formed a major part of consumer durables output before TV sets, refrigerators, and washing machines were produced in more than token amounts.

A second change in the civilian machinery index has been to include the officially reported value of production of metalcutting and forge-press machine tools. Since the official value of output series presumably cover all products in these two categories, they have the merit of including new products and reflecting changes over time in average quality.

Third, the value series for agricultural equipment, chemical equipment, equipment for consumer industries and instruments were reported by the Soviets in prices of 1 July 1967. In the absence of individual prices for other types of machinery, their values were increased by 17.2 percent.[6]

The inclusion of these more comprehensive Soviet ruble series introduces the uncertainty inherent in using Soviet value aggregates. The familiar "new product pricing" problem of Soviet statistics is the chief concern. That is, new products are assigned "temporary" prices set high enough to permit producers to recover expenses of the enterprise connected with research, development, and the tooling up for production. These prices are supposed to remain in effect only for the first year or two of production. Later, a permanent list price is supposed to be established based on normal production costs plus profit. But according to the Soviet critics, the temporary prices are often allowed to run on for years; Soviet statisticians apparently do not go back and replace temporary prices in the production series for previous years. The net effect of practices of this kind is a built-in price inflation embedded in the official indexes of production.

An Alternative Weighting of the Civilian Machinery Index

The machinery index suffers from the inclusion of quantity indexes that probably grow too slowly and value of output series that probably grow too fast. Moreover, the sum of the value series is probably disproportionately large in comparison to the total of the quantity series in the machinery sector. As a test of this weighting scheme, an attempt was made to calculate value-added weights for subbranches of machinery. The various machinery indexes were grouped into subbranches, with each subbranch having a value-added weight derived from the 1966 input-output table.[7] The results of this alternative index show rates of growth comparable to those of the machinery index in Table 1. The value weighted machinery index grows at 11.7 percent for 1951–60, and 9.2 percent for 1961–70; the value-added weighted (input-output) index grows at 10.7 percent and 8.1 percent for the two periods.

[6] All investment in equipment increased 7.1 percent in average price on 1 July 1967. The average prices of products covered by the official Soviet value of output series decreased 12 percent. The prices of all other producer durables would have had to increase by an average of 17.2 percent in order to produce an overall 7.1 percent price increase.

[7] See Appendix B.

A Comparison of Producer Durables With Investment Statistics

Investment goods make up the major portion of producer durables, so the trend of the producer durables index may be compared with that of the official Soviet data on investment in equipment. These series are compared in Table 4 where the official Soviet data on investment in equipment is lagged one year (on the assumption that equipment invested this year was produced last year) and reduced by the amount of net imports of equipment. The similarity of the growth of the two indexes is apparent. This is encouraging since the adjusted investment series is comprehensive with each individual product valued at its own price while the producer goods index is a sample. Thus, the producer durables sample index would appear to reflect accurately the growth of this part of the machinery sector. However, investment data could also be affected by the "new product pricing problem"; if so, the alignment of the producers durables sample index with Soviet investment in equipment may indicate that the growth of producer durables is overstated.

TABLE 4.—U.S.S.R.: COMPARISON OF THE SAMPLE INDEX OF PRODUCER DURABLES WITH A SOVIET INDEX OF INVESTMENT IN EQUIPMENT, 1950, 1955, AND 1960–70 (1968=100)

	1950	1955	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Producer durables sample	18	29	51	58	65	72	76	80	86	93	100	108	117
Official Soviet series on investment in equipment adjusted to a production basis [1]	15	31	51	57	62	70	76	80	88	96	100	112	117

[1] Assumes a lag of one year between production and investment; that is, investment shown here for 1950 is actually investment in 1951; also, the value of the official Soviet investment series was reduced by the amount of net imports equipment.

A Comparison With the Official Soviet Index of Growth in Gross Value of Output

The official Soviet index of growth in the gross value of output differs conceptually from the index of industrial production presented in this paper in several ways. First, it includes so-called intermediate products whose values are embodied in other, "final" products going to consumers; the present index includes the value of final products only. Second, the official Soviet index includes the "new product" pricing effect which tends to inflate real growth. Third, the Soviet index includes the growth in output of the defense industries.[8] The differences in growth rates of these two indexes (shown in Table 5) reflect the double-counting, the upward price bias and the inclusion of defense goods.

TABLE 5.—COMPARISON OF GROWTH OF OFFICIAL SOVIET INDEX OF INDUSTRIAL PRODUCTION AND THE PRESENT INDEX OF CIVILIAN PRODUCTION

	Average annual percentage rates of growth				
	1951–55	1956–60	1961–65	1966–70	1971–72
Official Soviet index of industrial production	13.1	10.3	8.6	8.5	7.1
Machine building-metalworking	15.8	14.2	12.4	11.8	11.2
Sample index of civilian production	10.7	8.9	6.9	6.8	5.6
Machine building-metalworking	12.1	11.3	9.3	9.1	9.1

[8] For a fuller discussion of these differences see R. V. Greenslade in V. Treml and J. Hardt, *op. cit.*

APPENDIX A

DERIVATION AND COMPARISON OF THE VALUE-ADDED WEIGHTS

This appendix consists of tables showing the derivation of the value-added weights for the year 1968 and the indexes of growth in civilian industrial production. The 1968 value-added weights are shown in Table A–1 and, for purposes of comparison, the value-added weights computed for 1960 and moved to 1968 are also shown. The methodology used to construct the 1968 weights was essentially the same as that used for the 1960 weights. Table A–2 shows the revised indexes of Soviet civilian industrial production by branch and by year for 1950–1972.

In the revised indexes shown in Table A–2, prices of 1 July 1967 replaced prices of 1 July 1955 for most commodities. Soviet sources provided price information for all products in the industrial materials sample. Data given was either in terms of a specific 1 July 1967 price, or a coefficient of change between 1955 and 1967 prices. In the machinery sample, the product groups reported in value terms were corrected by the Soviets for price changes in 1967. Since price data were not available for other types of machinery, their values were increased by 17.2 percent, based on a comparison of increases in investment and price changes in officially reported ruble series. No price adjustments were made for the food and soft goods branches of industry. Soviet sources indicate that prices remained constant for large product groups in both these branches. Further, both branches have subbranch value-added weights, which minimize the effect of price changes on growth of the respective branches.

TABLE A–1.—U.S.S.R.: DERIVATION OF VALUE-ADDED WEIGHTS FOR 1968 AND COMPARISON WITH 1960 VALUE ADDED WEIGHTS MOVED TO 1968

	1968 base-year weights					
	(Billion rubles—1968 prices)				(Percent)	
Branch	Wages and other income[1]	+ Depreciation[2]	+ Capital charge[3]	= Value added at factor cost	Percentage distribution of value added weights	1960 base-year weights moved to 1968[4]
Electric power	1.10	0.72	3.50	5.32	6.6	6.2
Coal products	3.70	.72	1.39	5.81	7.3	7.6
Petroleum products	.69	.84	3.60	5.13	6.4	3.5
Ferrous metals	2.66	.67	3.67	7.00	8.7	7.9
Nonferrous metals	1.42	.43	2.17	4.02	5.0	5.3
Forest products	4.22	.41	1.58	6.21	7.8	7.7
Paper and paperboard	.41	.15	.36	.92	1.1	1.2
Construction materials	3.07	.53	1.61	5.21	6.5	7.3
Chemicals	2.55	.56	2.16	5.27	6.6	5.9
Civilian machinery[5]	12.22	.87	4.43	17.52	21.9	24.0
Soft goods	6.93	.30	2.24	9.47	11.8	12.5
Processed foods	4.30	.61	3.30	8.21	10.3	10.9
Total	43.27	6.81	30.01	80.09	100.0	100.0

[1] Calculated for each branch as the sum of estimates of the State wage bill, regular social-insurance deductions, social nsurance deductions by producer cooperatives, payments to trade unions, and other money income not included in the wage fund, The State wage bill was calculated for the most part by multiplying branch employment reported in the Soviet statistical yearbook for 1968 (Moscow 1969), p. 205, by average earnings as reported in the 1969 "Yearbook of Labor Statistics" (Geneva, 1970). The social insurance deduction rates were taken from "Spravochnik partiynogo rabotnika vypusk vos'moy" (Moscow, 1963), pp. 439-40. Enterprise contributors to trade unions and other money income represent estimates for 1960 which have been moved forward to 1968.

[2] The branch amortization rates (for replacement only) used to compute depreciation in 1968 are rates which went into effect in 1963 and are still being used. The sources for these rates are: D.A. Baranov, "Teoriya amortizatsii tekhnicheskiy progress" (Moscow, 1965), p. 155, E. A. Ivanov, "Vosproizvodstvo i ispol'zovaniye osnovnykh fondov" (Moscow 1968) p. 196. These rates were applied to estimates of average annual fixed capital by branch based on the distribution shown in the Soviet statistical yearbook for 1968.

[3] Imputed interest on fixed and working capital was derived by applying a 12-percent charge to the capital stock at midyear except in ferrous and nonferrous metals, petroleum products, and forest products where reported profits were used. Working capital is defined as the sum of "trade material values" and "goods shipped and other working capital" less "prepaid expenses." Midyear working capital, taken from the Soviet statistical yearbook for 1968 was allocated among the branches in the same distribution as was used in the Soviet journal, "Planovoye Khozyaystvo," 1962, No. 9, p. 49.

[4] The weights are moved forward to 1968 by branch production indexes. See Joint Economic Committee, "Economic Performance and the Military Burden in the Soviet Union" (1970), p. 22; V. G. Treml and J. P. Hardt, editors, "Soviet Economic Statistics" (Duke University Press, 1972), p. 189–191.

[5] In the absence of value-added weights for the various branches of machine building, final product weights for 196t were constructed for producer durables and consumer durables on the assumption that the final product in each componen0 is roughly proportional to the value-added. These weights were then moved forward to 1968, giving weights of 82.41 percent for producer durables and 17.59 percent for consumer durables.

TABLE A-2.—U.S.S.R.: INDEXES OF INDUSTRIAL PRODUCTION, 1950–72

[1968=100]

Branch of industry	1968 weights[1]	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971[2]	1972[2]
Industrial materials	56.0	23.5	26.4	28.7	31.0	34.4	38.4	41.9	45.8	50.4	55.2	59.0	62.8	67.4	72.1	77.5	83.2	88.6	94.9	100.0	104.4	111.6	117.8	123.8
Electric power	11.9	14.5	16.5	18.9	21.3	23.8	26.8	30.2	33.1	37.2	41.8	46.1	51.6	58.3	64.8	72.1	79.3	85.4	91.9	100.0	107.9	116.2	125.6	134.9
Coal products	12.9	41.4	44.9	47.8	50.5	55.0	61.9	67.8	73.0	78.3	80.7	82.8	82.8	84.9	87.5	91.0	95.0	97.0	99.2	100.0	102.6	105.0	107.6	110.0
Petroleum products	11.4	13.9	15.5	17.3	19.4	21.9	24.0	29.2	34.0	38.5	43.7	49.2	54.7	61.4	67.9	73.1	79.0	85.7	93.4	100.0	106.4	115.0	122.9	129.9
Ferrous metals	15.6	22.3	25.6	28.9	31.6	34.9	38.6	41.7	44.5	47.6	52.8	56.9	61.9	66.8	71.3	77.5	83.1	89.3	95.3	100.0	102.5	108.6	113.0	117.4
Nonferrous metals	9.0	19.7	22.1	24.8	27.6	30.0	35.4	37.9	40.1	42.5	46.4	50.7	55.3	60.3	64.9	69.9	75.7	82.9	91.1	100.0	107.4	114.3	120.8	129.2
Forest products	13.8	41.3	47.1	48.0	49.4	55.5	58.4	60.4	64.9	70.9	78.3	78.4	78.7	81.3	85.6	89.5	90.8	91.4	96.7	100.0	102.1	107.8	111.9	116.2
Paper and paperboard	2.1	24.9	27.9	30.8	34.8	38.3	40.0	43.2	47.0	50.2	52.5	54.8	58.1	62.2	65.7	70.6	79.6	88.0	95.2	100.0	105.5	112.7	119.0	124.4
Construction materials	11.6	12.5	14.7	16.9	19.3	22.3	26.5	30.1	36.2	43.5	50.8	58.2	64.0	68.8	71.7	75.8	82.5	89.9	96.6	100.0	102.3	110.7	117.0	123.2
Chemicals	11.7	16.0	17.7	19.4	21.4	24.0	27.6	30.8	33.3	37.0	39.7	43.3	47.7	52.7	58.6	67.0	76.8	84.7	93.2	100.0	105.9	118.4	127.7	136.2
Civilian machinery	21.9	16.4	16.3	17.7	20.9	24.4	29.0	33.1	38.0	40.8	43.4	49.4	56.0	62.4	68.6	73.0	77.0	84.2	91.3	100.0	109.3	118.9	130.8	141.5
Producer durables	82.4	17.7	17.3	18.6	21.7	24.9	29.0	33.7	39.3	42.3	44.8	51.0	58.3	65.5	71.9	76.1	79.9	86.5	92.6	100.0	107.9	116.7	127.9	137.7
Consumer durables	17.6	10.2	11.4	13.9	17.2	21.8	28.7	30.2	32.1	33.3	36.9	41.5	45.2	48.1	53.2	58.7	63.9	73.7	85.4	100.0	116.3	128.7	144.7	159.0
Consumer nondurable goods	22.1	28.6	33.4	35.8	39.6	43.8	47.1	50.9	52.8	57.7	62.3	65.9	69.6	73.4	75.1	77.5	82.2	86.8	93.8	100.0	105.3	112.3	116.5	118.2
Soft goods	53.6	29.0	34.2	36.6	40.4	46.0	49.3	53.2	55.7	60.4	65.1	69.2	72.1	75.1	75.6	77.0	77.9	84.2	92.0	100.0	107.3	114.5	119.6	121.2
Processed foods	46.4	28.2	32.4	34.9	38.7	41.4	44.5	48.2	49.4	54.6	59.2	62.2	66.7	71.5	74.4	78.0	87.1	89.7	95.9	100.0	103.1	109.7	112.9	115.3
Civilian industrial production		23.0	25.7	27.9	30.7	34.3	38.2	42.0	45.6	49.9	54.2	58.5	62.8	67.6	72.0	76.5	81.7	87.3	93.9	100.0	105.7	113.4	120.4	126.4
Official Soviet gross value of output:																								
All industry		16.9	19.7	22.0	24.6	27.8	31.3	34.6	38.1	42.0	46.8	51.2	55.9	61.2	66.2	71.1	77.2	84.0	92.4	100.0	107.1	116.2	125.2	133.3
Machinebuilding-metalworking		9.4	11.0	12.8	14.9	17.3	20.4	23.2	26.3	29.9	34.5	39.6	45.6	52.5	59.4	65.0	71.2	79.6	89.3	100.0	111.7	124.2	138.3	153.5

[1] The weights within each sector have been adjusted to add to 100 percent.

[2] Preliminary.

APPENDIX B

EXPERIMENTAL WORK ON THE CIVILIAN MACHINERY SAMPLE

This appendix contains the results of experimental work on the civilian machinery sample which has not been incorporated into the index of Soviet civilian industrial production. The civilian machinery sector is large and diverse, and the sample represents some subbranches more completely than others. Up to now, prices have been used for weighting items included in the branch sample, and therefore, growth of some of the subbranches has influenced unduly the aggregate index of civilian machinery output. In this appendix, value-added weights have been introduced for subbranches of the civilian machinery sector. Compared to the series without subbranch weights presented in Table A–2, the effect of the change is to reduce somewhat the rate of growth of civilian machinery over the whole period, 1950 to 1972 (see Table B–1).

TABLE B-1.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF CIVILIAN MACHINERY PRODUCTION, 1951–70

[In percent]

	1951–60	1961–65	1966–70
Civilian machinery production based on input-output value-added weights	10.7	9.0	7.1
Civilian machinery production based on sample value weights	11.7	9.3	9.1

The set of value-added weights for the civilian machinery subbranches were calculated for 1968 using information from the 1966 Soviet input-output table,[1] supplemented by collateral information. Although the data underlying the industry and branch of industry weights (see Appendix A) are on an "establishment" basis while those of the civilian machinery subbranch weights in Table B–2 are on a "product" basis, the methodology used to construct the value-added weights was similar. However, depreciation was not included in the machinery subbranch value-added in Table B–2 because the price and real value changes from 1966 to 1968 could only be calculated for wage and capital data. The resultant weights (wages plus capital charges) have not been fully tested and are therefore tentative.

TABLE B-2.—U.S.S.R.: DERIVATION OF 1968 BASE-YEAR INPUT-OUTPUT VALUE-ADDED WEIGHTS FOR BRANCHES OF CIVILIAN MACHINERY

	Million rubles				Percentage distribution of value-added weights
	Wages[1]	+ Social insurance[2]	+ Capital charge[3]	= Total value-added	
Energy and power M. & E.	377.18	29.04	152.33	558.55	5.4
Electrotechnical M. & E.	1,046.53	80.57	288.70	1,415.80	13.7
Machine tools	311.36	23.97	116.02	451.35	4.4
Forge press M. & E.	57.89	4.46	29.60	91.95	.9
Precision instruments	797.66	61.42	157.11	1,016.19	9.8
Mining and metallurgy	618.43	47.62	204.54	870.59	8.4
Pumps and compressors	159.78	12.31	68.25	240.34	2.3
Equipment for consumer industries	351.54	27.07	117.75	496.36	4.8
Hoisting and transportation	143.70	11.06	54.95	209.71	2.0
Construction M. & E.	164.00	12.63	56.11	232.74	2.3
Transportation	663.32	51.07	319.83	1,034.22	10.0
Automobiles	857.78	66.05	301.40	1,225.23	11.9
Agricultural M. & E.	1,034.32	79.64	387.94	1,501.90	14.5
Sanitary engineering	238.71	18.38	82.97	340.06	3.3
Other machine building	438.25	33.74	174.14	646.13	6.3
Total	7,260.45	559.03	2,511.64	10,331.12	100.0

[1] Wage data were taken from the "Reconstructed 1966 Soviet Input-Output Table in Producers' Values" (Research Analysis Corporation, 1972) and moved forward to 1968.

[2] Social insurance was calculated as 7.7 percent of wages, the same rate used in calculating social insurance for the civilian machinery branch.

[3] Capital data were taken from the "Reconstructed 1966 Soviet Input-Output Table in Producers' Values" and moved forward to 1968. The imputed interest on capital was derived by applying a 12 percent charge to the capital stock, the same rate used in calculating the capital charge for the civilian machinery branch.

[1] Research Analysis Corporation, *The Reconstructed 1966 Soviet Input-output Table in Producer Prices* (Washington, D.C., 1972).

The commodities within the civilian machinery sample were placed in their appropriate input-output machinery sector according to the *Sector and Commodity Classification of the Soviet 1966 Input-Output Table.* Table B–4 presents an abbreviated listing of the civilian machinery sample.

TABLE B-3.—U.S.S.R.: INDEXES OF CIVILIAN MACHINERY PRODUCTION (1968=100)[1]

	1968 Value-added weights	1950	1959	1960	1965	1966	1968	1970	1971
Energy and power machinery and equipment	5.41	19.93	47.58	56.96	90.41	94.97	100.00	98.92	99.39
Electrotechnical machinery and equipment	13.70	11.48	34.17	41.53	80.93	85.49	100.00	110.46	108.73
Machine tools	4.37	11.00	43.09	48.66	74.10	82.69	100.00	113.59	122.30
Forging—pressing	.89	7.40	52.84	60.00	74.88	81.86	100.00	114.42	126.98
Precision instruments	9.84	3.48	31.09	36.88	65.47	74.91	100.00	144.19	158.70
Mining and metallurgy	8.43	39.11	68.83	75.83	90.84	95.35	100.00	97.87	130.10
Pumps and compressors (including chemical equipment)	2.33	3.64	30.55	39.23	75.41	85.65	100.00	112.69	126.62
Equipment for consumer industries	4.80	16.95	52.54	57.48	72.55	83.17	100.00	117.60	125.45
Hoisting and transportation	2.03	21.54	46.88	49.41	78.53	85.99	100.00	117.85	122.87
Construction machinery and equipment	2.25	20.43	44.07	51.05	81.63	88.06	100.00	114.20	115.00
Transportation	10.01	41.90	74.30	79.07	102.19	101.97	100.00	104.48	114.77
Automobiles	11.86	25.40	53.18	58.93	76.77	84.21	100.00	109.44	125.54
Agricultural machinery and equipment	14.54	17.45	40.22	46.32	85.25	90.54	100.00	114.94	124.96
Sanitary engineering	3.29	13.69	49.56	58.07	90.29	94.55	100.00	109.16	114.28
Other machine building	6.25	2.05	23.23	27.14	55.64	71.32	100.00	131.82	131.82
Civilian machinery		18.96	46.32	52.52	80.83	87.25	100.00	114.12	123.93

[1] The indexes in this table are based on a sample of consumer durables because the official Soviet value of output series could not be satisfactorily reconciled with the machinery branches reported in the Soviet input-output table for 1966.

TABLE B–4.—COMMODITY GROUPS INCLUDED IN THE CIVILIAN MACHINERY SAMPLE

Commodity groups:	*Unit of measurement*
Energy and power equipment	Kilowatts and units.
Electrotechnical machinery and equipment	Do.
Metalcutting machine tools	Value of output.
Forge-press machinery	Do.
Railway equipment	Units.
Motor vehicles	Units by model.
Agricultural equipment	Value of output.
Construction and road equipment	Units by type and size.
Hoist-transport equipment	Units.
Mining and other equipment	Do.
Equipment for consumer industries	Value of output.
Civilian shipbuilding	Do.
Sanitary technical equipment	Units.
Instruments	Value of output.
Consumer electronics	Units by type.

THE SOVIET PETROLEUM INDUSTRY: PROMISE AND PROBLEMS

By J. RICHARD LEE

CONTENTS

TABLES

I. RESERVES

Potential reserves of oil and natural gas in the U.S.S.R. are very large. The major undeveloped reserves, however, are located east of the Ural Mountains, and especially in West Siberia, where climate, terrain, and working conditions are difficult.

The prolific oil fields in the Urals-Volga region that contributed to the rapid expansion of output during the 1950s and 1960s are being depleted. Production from this region is being maintained by extensive waterflooding and by exploration and development of smaller, deeper, and economically less attractive deposits. Increases in production of oil in the 1970s are to come primarily from reserves in West Siberia and western Kazakhstan. Western geologists who have studied and visited the area claim that the West Siberian basin is one of the largest sedimentary basins in the world. They estimate proved and probable reserves of oil there to be at least 40 billion barrels (5.5 billion tons), approximately the same amount estimated for the North Slope of Alaska. The largest deposits discovered to date in West Siberia are concentrated in the middle reaches of the Ob River, an area of bogs and marshes that complicate drilling and pipeline operations.

The U.S.S.R. claims to have the largest reserves of natural gas in the world. "Explored reserves" [1] of gas, as of 1 January 1972, were reported to be 18 trillion cubic meters. (Proved reserves of natural gas in the U.S. at the end of 1972 were estimated at about 8 trillion cubic meters.) Eight of the largest gas deposits, with total explored

[1] Broader in concept than the U.S. definition of proved reserves.

reserves of some 10 trillion cubic meters, are located in northern Tyumen Oblast (West Siberia) where permafrost covers the area to depths of 1,000 feet and more. Drilling and building pipelines in the permafrost regions require the mastering of new technology and the manufacture of high quality equipment. Thus far the Soviet Union has been only partially successful in either of these endeavors.

II. Production

At the present time, the Soviet Union is second only to the United States in the production of crude oil and natural gas. In 1972, Soviet output of crude oil was about 394 million metric tons (almost 7.9 million barrels per day) and natural gas production reached a level of some 221 billion cubic meters (7.8 trillion cubic feet). Together oil and gas accounted for an estimated 62% of energy production from primary sources in that year (see Table 1)[2]. Although these production levels are considerably higher than in 1960 (see Table 2), the rate of growth during the last few years has declined. Rates of

TABLE 1.—U.S.S.R. SHARE OF FUELS IN NATIONAL OUTPUT, 1960–72[1]

[In percent]

Fuel	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972[2]
Coal	53.9	50.5	48.8	45.9	44.2	42.7	40.7	39.4	38.0	37.3	35.4	34.6	33.8
Crude oil	30.5	32.4	34.2	34.8	35.1	35.8	36.7	37.8	39.2	39.9	41.1	41.8	42.6
Natural gas	7.9	9.7	10.9	12.4	13.9	15.5	16.5	17.2	17.9	18.3	19.1	19.5	19.6
Fuelwood	4.1	4.0	3.7	3.6	3.6	3.5	3.1	2.8	2.6	2.4	2.2	2.1	2.0
Peat	2.9	2.7	1.7	2.5	2.4	1.7	2.3	2.1	1.6	1.4	1.5	1.3	1.3
Shale	.7	.7	.7	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Data derived from official Soviet statistics of output of fuel, expressed in units of standard fuel (U.S.S.R. Tsentral'noe statisticheskoe upravlenie, "Narodnoe khoziaistvo SSSR" 1922–72, p. 162).
[2] Preliminary estimate.

TABLE 2.—SOVIET PRODUCTION OF OIL AND GAS, 1955, 1960–73, 1973–75 PLAN

Year	Crude oil (million metric tons)	Natural gas (billion cubic meters)	Year	Crude oil (million metric tons)	Natural gas (billion cubic meters)
1955	70.8	9.0	1968	307.4	169.1
1960	147.2	45.3	1969	326.0	181.1
1961	165.3	59.0	1970	348.8	197.9
1962	185.4	73.5	1971	371.8	212.4
1963	205.1	89.8	1972	[1] 394	[2] 221
1964	222.5	108.6	1973 plan [3]	429	250
1965	241.7	127.7	Revised goal [4]	(424)	(238)
1966	263.8	143.0	1974 plan [3]	461	280
1967	286.6	157.4	1975 plan [3]	496	320

[1] Plan 395.
[2] Plan 229.
[3] Original 5-year plan.
[4] Announced in December 1972.

SOURCES

Natural gas: 1955, 1960–72—"U.S.S.R. Tsentral'noye Statisticheskoye Upravleniye, Narodnoye Khozaistvo SSSR 1922–72," p. 163. 1972—"Pravda," Jan. 30, 1973, p. 1. 1972—75 plan—"Pravda," Nov. 25, 1971, pp. 1–2.
Crude oil: 1955, 1960–71—"Narodnoye Khozaistvo SSSR 1922–72," op. cit., p. 137; "Statisticheskii Ezhegodnik Stran-Chlenov Soveta." "Ekonomicheskoi Vzaimopomoshchi 1971," p. 79. 1972—"Pravda." Jan. 30, 1973, p. 1. 1972–75 plan—"Pravda," Nov. 25, 1971, pp 1–2.

[2] Although the U.S.S.R. is the world's leading producer of coal, since 1968 oil and gas together have accounted for a larger share of total fuel production. In 1968 crude oil alone surpassed coal for the first time as the major fuel produced in the Soviet Union. Future plans call for continued increases in coal output but it will be used mainly in those sectors of the economy where it cannot be replaced or where it is cheaper than oil or gas.

increase in oil output have dropped from 7% in 1970 to 6% in 1972; correspondingly, output of gas exhibited an even sharper decline in growth during the same period, from about 9% to 4%.

Production of oil and gas in the U.S.S.R. in 1972 was below plan and the rates of increase in output were the lowest since the end of World War II. The shortfall in oil production was at least 1 million tons, the first failure in annual plan fulfillment during the past twenty years. The natural gas industry has had a poor record of plan achievement during the past 10–15 years, but the shortfall of 8 billion cubic meters in 1972 was the largest annual underfulfillment recorded in the postwar period. The increase in gas production—about 9 billion cubic meters—was the smallest since 1959. As a result of the problems that caused this poor performance, original goals for production of oil and gas in 1973 have been lowered (see Table 2). It appears that achievement of the original 1975 target for production of 496 million tons of crude oil is doubtful and that attainment of the goal of 320 billion cubic meters of natural gas will be impossible.

The difficulties of exploiting the impressive reserves stem not only from the hostile natural conditions but also from poor planning and organization and a lag in technology. The U.S.S.R. lacks sophisticated geophysical tools, such as modern seismic equipment and computerized field units, used routinely in the West. Without such equipment Soviet capability to locate deep structures is limited. Poor quality drilling equipment also is a bottleneck. Shortages of good quality pipe for drilling and casing, poor quality drill bits, and underpowered mud pumps are among the items that contribute to inefficient operations in the field. Heavy reliance on the turbodrill, which is very inefficient below 8,000 feet, has contributed to rising costs and reduced drilling rates as depths of wells increase. Because of the lack of treating facilities in the field, large volumes of associated gas—some 12 billion cubic meters per year—are being flared, a particularly wasteful practice. These and other shortcomings in Soviet technology and equipment have led the U.S.S.R. during the past two or three years to turn to Western suppliers for much needed technical know-how and modern equipment.

A. Oil

As production from the Urals-Volga fields levels off, output from newly developed oilfields in West Siberia will assume a greater role in national output (see Table 3). These Siberian fields are to provide at least two-thirds of the increase in oil production during 1971–75. Over the past two years (1971–72) oil output in West Siberia exceeded plan, but this success was offset by lower-than-planned output from the old Baku and Groznyy fields. Transporting Siberian oil to major refineries and consuming centers in the western part of the country remains a bottleneck pending completion of a pipeline.

The Soviet Union leads the world in the use of large-diameter pipelines but construction has not kept pace with needs. Shortages of line pipe and equipment, such as valves, compressors, and pumps, the lack of trained crews, and difficult supply problems in remote areas have contributed to the shortfall in the pipeline building program. During the past decade construction of gas pipelines has had priority over oil pipelines as there is no other economical means of transporting gas. Almost 40% of the oil moved in the

TABLE 3.—REGIONAL PRODUCTION OF CRUDE OIL IN THE U.S.S.R., 1965, 1970–71, 1975 PLAN

[In millions of metric tons]

Region	1965	1970	1971	1972	1975 plan
U.S.S.R., total	242	349	372	394	496
European part of the U.S.S.R. and the Urals	226	285	292	292	314
Tatar ASSR	80	102	103	102	101
Bashkir ASSR	41	39	39	40	40
Kuybyshev Oblast	33	35	36	36	35
Perm Oblast	10	16	17	18	22
Orenburg Oblast	3	7	8	9	14
Komi ASSR	2	6	6	6	10
Checheno-Ingush ASSR	9	20	22	20	
Azerbaydzhan SSR	22	20	19	18	
Ukraine SSR	8	14	14	14	92
Byelorussia SSR	0	4	5	6	
Others	18	22	23	23	
East of the Urals	16	64	80	102	182
West Siberia	1	31	44	63	125
Turkmen SSR	10	14	15	16	22
Kazakh SSR	2	13	16	18	30
Others	3	6	5	5	5

SOURCES

1965, 1970, 1971—"Tsentral'noye Statisticheskaye Upravleniye, Narodnoye Khozaistvo SSSR" 1922–72, pp. 501–827. 1972—"Ekonomicheskaya Gazeta," No. 5, January 1973, p. 2.

1975 plan—"Ekonomika Neftyanoy Promyshlennosti", No. 1, 1971, pp. 22–26; "Sovetskaya Rossiya", Dec. 9, 1971, p. 2, and July 2, 1972, p. 2; "Pravda," Apr. 6, 1971, pp. 2, 4 and Dec. 17, 1972, p. 2; "Sotsialisticheskaya Industriya," Apr. 4, 1972, p. 2; "Iskra," Nov. 28, 1971, p. 1; "Vyshka," Nov. 28, 1971, "Neftyanik," No. 12, 1971, p. 4 and No. 2, 1973, p. 5.

U.S.S.R. is still transported by rail at a cost almost three times that of pipeline transport. In September 1972 a new separate Ministry of Construction of Enterprises of the Oil and Gas Industry was formed with a major responsibility to overcome construction delays within the petroleum industry. During 1972 priority apparently was given to oil pipeline construction, especially the 48-inch diameter crude oil line from the large Samotlor field in West Siberia to Al'metyevsk in the Urals. When this line is put into operation, perhaps by mid-1973, if present construction problems can be solved, some of the Siberian oil will be delivered to refineries in the Urals-Volga region and some will be exported to Eastern Europe via the Friendship crude oil pipeline system, which is being expanded to reach a delivery capability of 50 million tons per year in 1975. (The growth of the total Soviet oil and gas pipeline network since 1960 is shown in Table 4.)

TABLE 4.—EXTENT OF THE OIL AND GAS PIPELINE NETWORK IN THE U.S.S.R., 1955, 1960–71

[In thousands of kilometers]

Year	Oil	Gas	Year	Oil	Gas
1955	10.4	4.9	1966	29.5	47.4
1960	17.3	21.0	1967	32.4	52.6
1961	20.5	25.3	1968	34.1	56.1
1962	21.7	28.5	1969	36.9	63.2
1963	23.9	33.0	1970	37.4	67.5
1964	26.9	36.9	1971	41.0	70.7
1965	28.2	41.8			

SOURCES

Oil pipelines: 1955, 1960–71—"U.S.S.R. Tsentral'noye Statisticheskoye Upravleniye, Narodnoye Khozaistvo SSSR 1922–72," p. 306.

Gas pipelines: 1955, 1960–68—"U.S.S.R. Tsentral'noye Statisticheskoye Upravleniye, Narodnoye Khozaistvo SSSR v 1968 g.," p. 486. 1969–70—"Narodnoye Khozaistvo SSSR v 1970 g.," p. 450. 1971—"Nar. Khoz. SSSR 1922–72," op. cit., p. 306.

The U.S.S.R. is self-sufficient in petroleum. Domestic supplies of oil products apparently are adequate to meet most Soviet needs. Some local shortages occur, especially during peak periods of use such as the harvest season in late summer, but they stem from transport bottlenecks, such as lack of oil product pipelines and overdependence on rail movement, and from some lack of flexibility in refinery operations. Demands are increasing, however, for higher quality products, such as high octane gasoline and low-sulfur diesel fuel, and the refining sector of the oil industry is straining to keep pace by modernizing existing refineries and installing secondary processing facilities. The past record of refinery expansion has not been good because much of the processing equipment has not been installed as rapidly as needed, or when completed is often operated below design capacity for some time.

Since the mid-1950s Soviet production of oil has surpassed total domestic demand, and exports of oil have risen substantially. In recent years the annual export of oil has been the largest single source of foreign exchange earnings. In 1971 alone, hard currency earnings from oil exports amounted to some $570 million. Since 1960 total exports of oil rose from about 33 mililon tons to some 105 million in 1971, an average annual increase of 11% during the period (see Table 5). Until 1969 the largest share of such exports went to non-Communist countries, especially to Western Europe. Since 1969, however, other Communist countries have been receiving more than half of the deliveries of Soviet oil, chiefly because of the rapidly rising demands of Eastern Europe. This area, exclusive of Romania which is a net exporter of oil, relies upon the U.S.S.R. for some 80–85% of its total oil supplies. However, the U.S.S.R. has requested Eastern Europe to seek additional supplies of oil from the Middle East after 1975. The Soviet Union may not be able to provide enough oil to meet all of the increasing needs of Eastern Europe, those of its own expanding economy, and still maintain exports to non-Communist countries at present levels. During the past two or three years East European countries have signed agreements with Middle East countries, especially Iran and Iraq, to import supplemental quantities of crude oil in exchange for goods and technical services.

TABLE 5.—U.S.S.R.: EXPORTS OF OIL, 1960, 1962–71 [1]

[In millions of metric tons]

Year	Grand total [2]	Exports to non-Communist countries			Exports to other Communist countries		
		Crude oil	Products	Total	Crude oil	Products	Total
1960	33.2	9.0	9.1	18.1	8.8	6.3	15.1
1962	45.4	13.6	11.1	24.7	12.7	8.0	20.7
1963	51.4	15.4	13.0	28.4	14.8	8.2	23.0
1964	56.6	18.8	12.5	31.3	17.9	7.4	25.3
1965	64.4	21.0	14.5	35.5	22.4	6.5	28.9
1966	73.6	24.8	16.5	41.3	25.5	6.8	32.3
1967	79.0	26.8	16.9	43.7	27.3	8.1	35.4
1968	86.2	26.7	18.0	44.7	32.5	9.0	41.5
1969	90.8	(3)	(3)	43.2	(3)	(3)	47.6
1970	95.8	(3)	(3)	45.4	(3)	(3)	50.4
1971	105.1	(3)	(3)	49.7	(3)	(3)	55.4

[1] Data derived from official Soviet trade statistics (U.S.S.R. Ministerstvo Vneshnei Torgovli, "Vneshnaya Torgovlya S.S.R. za . . . god," Moscow, Vneshtorgizdat, annual).
[2] Because of rounding, components may not add to total shown.
[3] Not available.

The U.S.S.R. is encouraging Japanese and U.S. firms to invest a total of about $1 billion in the construction of a 48-inch diameter pipeline to move West Siberian oil some 4,200 miles to the Soviet Far East and Japan. This pipeline probably would parallel the Trans-Siberian Railroad, would take 5–6 years to build, and could transport some 50 million tons annually. Delivery of 25–40 million tons of oil to Japan is anticipated as the Japanese seek to diversify sources of supply. The U.S.S.R. also has made inquiries of U.S. and Japanese companies about exploring for and developing petroleum resources in the offshore areas around Sakhalin. No firm agreement has been reached on either of these ventures to date, but they appear to be good bets for the future assuming financial conditions can be agreed on. If Western technical know-how can be utilized to exploit Soviet reserves, larger quantities of oil than now anticipated may be available by 1980 for Soviet domestic use and for export.

B. Natural Gas

Despite its poor record in plan fulfillment, the Soviet natural gas industry has dramatically increased production and discovery of new reserves during the past two decades. Lingering problems that have contributed to production shortfalls are centered on an inability to coordinate field development with construction and efficient operation of pipelines and gas treatment plants in new gas fields. In recent years depletion of some of the older major gas fields in the western part of the country also has been a factor in plan underfulfillment. Regions east of the Urals are providing an ever larger share of new gas reserves and output. In 1965, only about one-sixth of total production originated in eastern regions, whereas plans for 1975 call for almost half of national output to come from this area, primarily Central Asia and West Siberia (see Table 6). Ability to reach the

TABLE 6.—REGIONAL PRODUCTION OF NATURAL GAS IN THE U.S.S.R., 1965, 1970–71, 1975 PLAN

[Billion cubic meters]

Region	1965	1970	1971	1975 plan
U.S.S.R., total	128	198	212	320
European part of the U.S.S.R. and the Urals	109	142	149	166
Ukraine SSR	39	61	65	62
North Caucasus	35	35	36	45
Azerbaydzhan SSR	6	6	6	3
Orenburg Oblast	0	1	3	26
Komi ASSR	1	7	10	16
Tatar ASSR	3	4	4	14
Bashkir ASSR	3	2	1	
Others[1]	22	26	24	
East of the Urals	19	56	63	154
West Siberia	1	9	9	44
Turkmen SSR	1	13	17	65
Uzbek SSR	16	32	33	37
Othe s	1	2	4	8

[1] Principally other fields in the Urals-Volga region.

SOURCES

1965, 1970, 1971, Tsentral'noye Statisticheskoye Upravleniye, Narodnoye Khozaistvo SSSR 1922–72, pp. 501–827. 1972, Ekonomicheskaya Gazeta, No. 8, February 1973, p. 2. 1975 plan, Sovetskaya Rossiyva, Dec. 9, 1971, p. 2; Pravda, July 11, 1971, p. 2; Gazovaya Delo, No. 12, 1972, p. 4; Vyshka, Dec. 10, 1971, p. 2; Pravda Ukrainy, Nov. 27, 1971, p. 2; Neft i Gaz Promyshlennost' No. 1, 1972, p. 3; Pravda Vostoka, Dec. 17, 1971, p. 2; Kazakhstan Pravda, Dec. 17, 1971, p. 2; Turkmen Iskra, Nov. 28, 1971, p. 1.

1975 target depends chiefly on rapid development of gas deposits in Central Asia and on completion of two large-diameter (48-inch and 56-inch) pipelines from those fields to major consuming areas in the European part of the Soviet Union. Construction of these lines is running behind schedule because of inadequate supplies of pipe, valves, and compressors and because of the emphasis on oil pipeline construction in 1972. Very large compressor stations, up to 25,000 kilowatts capacity, are required for these pipelines, but in the recent past Soviet manufacturers have had difficulty in providing compressors of a smaller size (up to 10,000 kilowatts capacity).

In the permafrost zones of the northern part of West Siberia, where much of future increases in output will originate, successful exploitation of gas deposits and construction of pipelines will require a significant improvement in the level of Soviet working technology and in the quality of equipment used. Soviet tubular steel goods—drill pipe, casing, tubing, pump rods, linepipe, etc.—are known to contain flaws and impurities that make them very brittle and subject to breaking on impact at low temperatures. Improper well design, poor drilling fluid technology, and the lack of suitable blow-out preventers have been major causes of drilling accidents in the area to date. Failure to insulate the drilling column properly has resulted in loss of some gas wells and formation of hydrates in the wells has caused breakdowns of equipment in service. The laying of gas pipelines in the permafrost has been accomplished but not without serious problems of maintenance and operation. Valves and fittings have cracked, temperature variations and ground heave have caused sections of pipeline to slip off of pilings, and some sections laid on the ground sank out of sight because the surface proved unstable. The history of efforts thus far indicate the permafrost problems have been the most serious obstacle to northern gas field development, a fact acknowledged by Premier Kosygin in 1972.

Until the last few years almost all of the natural gas produced in the U.S.S.R. was consumed domestically. In recent years small volumes of gas have been exported to Eastern Europe and to Austria but these exports have been offset by imports from Afghanistan and Iran. As a result of recent contracts signed with West Germany, Italy, France, and Finland and agreements with East European countries, the U.S.S.R. should become a net exporter of some 8 billion cubic meters of gas in 1975 (see Table 7). In February 1973, however, the U.S.S.R. was unable to take advantage of an Austrian offer to double purchases of Soviet natural gas. Soviet Foreign Minister Patolichev cited inadequate pipeline capacity from domestic gas fields as the reason for refusal at this time.

Within the past two years Soviet officials have proposed that U.S. and Japanese firms invest and cooperate in developing Siberian gas deposits and take repayment in long term deliveries of liquefied natural gas. A consortium of U.S. companies has offered to develop pipeline, liquefaction, and port facilities in the U.S.S.R. that would permit shipment of 20 billion cubic meters of gas per year over a 25-year period from the Urengoy field in West Siberia to the U.S. east coast. The Urengoy field is claimed to be the largest gas deposit in the world with reserves of some 4–6 trillion cubic meters. The gas

TABLE 7.—ESTIMATED SOVIET TRADE IN NATURAL GAS, 1965, 1970–71, 1975 PLAN

[Billion cubic meters]

Country	1965	1970	1971	1975 plan
Exports	0.4	3.3	4.5	22.5
Eastern Europe	.4	2.3	3.1	11.5
Czechoslovakia	0	1.3	1.6	3.0
Poland	.4	1.0	1.5	1.5
Bulgaria	0	0	0	3.0
East Germany	0	0	0	3.0
Hungary	0	0	0	1.0
Western Europe	0	1.0	1.4	11.0
Austria	0	1.0	1.4	1.5
Finland	0	0	0	.5
Italy	0	0	0	6.0
West Germany	0	0	0	3.0
Imports	0	3.6	8.1	14.0
Afghanistan	0	2.6	2.5	4.0
Iran	0	1.0	5.6	10.0

SOURCES

1965, 1970, 1971, U.S.S.R. Ministerstvo Vneshnei Torgovli, Vneshnaya Torgovlya SSSR za 1966 g and 19#1 g, Vneshtorgizdat. 1975 plan, Petroleum Press Service, August 1971, p. 289 and September 1971, p. 325; World Oil, Aug. 15, 1971, pp. 76–89; Journal of Commerce, Aug. 1, 1972, p. 9.

is to be moved over permafrost regions through a 48-inch diameter pipeline to a liquefaction plant in the vicinity of Murmansk, an ice-free port on the Kola peninsula. There it will be liquefied and shipped by LNG tanker to the U.S. Another cooperative venture proposed by the U.S.S.R. to develop East Siberian gas deposits near Yakutsk and to export gas to Japan, and possibly to the U.S. west coast, is less attractive. The reserves claimed for the region thus far are inadequate to support deliveries on the scale discussed—some 30–50 billion cubic meters per year for 25 years. Western equipment and technology supplied under such arrangements would undoubtedly help the U.S.S.R. to solve many of the problems associated with development of Siberian resources. Moreover, after retirement of the initial debts, Soviet exports made possible by such deals would earn significant quantities of hard currency that could be used to finance further imports of technology and equipment for general industrial development.

AUTOMOTIVE TRENDS IN THE USSR

By IMOGENE U. EDWARDS

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TABLES

FIGURES

Since 1966 the USSR has been engaged in a major effort to modernize its small and underdeveloped automotive industry, and to boost sharply the production of passenger cars and heavy trucks. The modernization and expansion program, vigorously pushed by Soviet leadership at the highest level, marks a radical change in official policy. Soviet leaders from Stalin through Khrushchev had

purposely kept output at a low level in order to maintain high growth rates in other sectors of industry. Thus, by 1965, total output of motor vehicles amounted to only 616,000 units and of passenger cars only 201,000, far below that of any industrialized country. Moreover, Soviet motor vehicle production facilities were antiquated, and the design and quality of both passenger cars and trucks were far below world standards.

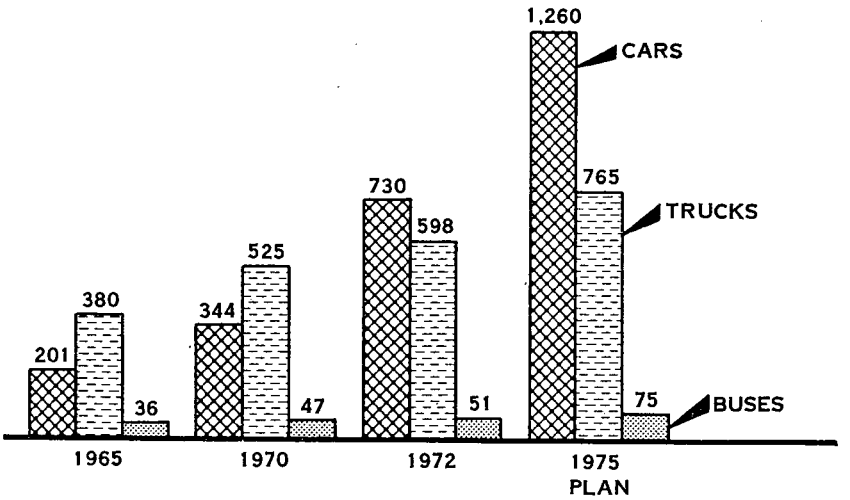
The decision to expand motor vehicle production, once made, rapidly assumed the proportions of a crash program. Construction of a new passenger car plant at Tol'yatti during 1966–70 and a new heavy truck plant at Naberezhnyye Chelny during 1971–75 were the largest single industrial investment programs of the Eighth and Ninth Five-Year Plans respectively. The entire modernization program, which will continue at least until 1980 and involve the construction of at least one more truck facility and expansion of the Tol'yatti plant, represents an enormous investment in plant and equipment of up to $5 billion. Secondary and tertiary expenditures for service stations and automotive repair facilities could push total program costs well above the $5 billion mark by 1980. Outfitted mostly with Western (including US) machinery and equipment, the program represents the largest investment in Western technology ever made by a Communist country.

Overall Goals for the Ninth Five-Year Plan (1971–75)

The USSR has set ambitious goals for its automotive industry during the current (Ninth) Five-Year Plan (See Figure 1). In 1975,

FIGURE 1.

Soviet Production of Motor Vehicles in Recent Years and Plans for 1975



output of all motor vehicles—passenger cars, trucks and buses—is planned to reach 2,100,000 units compared to 916,000 units in 1970, an increase of 129 percent. Such an increase in motor vehicle production is unprecedented in Soviet experience and rarely matched in non-Communist countries. In recent years only Japan has achieved a higher rate.[1] Output of passenger cars in the USSR is planned to grow at an especially rapid rate of 30 percent a year as shown in the tabulation below:

	Goal for 1975 (thousands of units)	Increase over 1970 (percent)	Average annual rate of increase (percent)
Passenger cars	1,260	266	30
Trucks	765	46	8
Buses	75	60	10
Total	2,100	129	18

If output goals are achieved, the USSR will join the United States, Japan, the United Kingdom, West Germany, France, and Italy as a major producer of motor vehicles. Soviet output of motor vehicles will rise from 11 percent of US production in 1970 to about 20 percent in 1975. Output of cars, trucks, and buses for the years 1960 through 1972 is given in Table 1.

TABLE 1.—SOVIET PRODUCTION OF MOTOR VEHICLES, 1960–72[1] AND 1975 PLAN

[In thousands]

	Passenger cars	Trucks	Buses	Total
1960	139	362	23	524
1961	149	382	25	555
1962	166	382	29	577
1963	173	382	32	587
1964	185	385	33	603
1965	201	380	36	616
1966	230	408	37	675
1967	251	437	40	729
1968	280	478	42	801
1969	294	504	46	844
1970	344	525	47	916
1971	529	564	49	1,143
1972[3]	730	598	51	1,379
1975[4]	1,260	765	75	2,100

[1] "Narodnoye khozyaystvo SSSR" 1922–72, p. 186 except as otherwise noted.
[2] Individual figures and totals may not agree because of rounding.
[3] "Izvestiya," Jan. 30, 1973.
[4] Gosudarstvennyy pyatiletiy plan razvitiya narodnovo kozyaistva SSSR na 1971–75 gody," p. 126.

The Passenger Car Program

The expansion of the Soviet passenger car industry is a dramatic example of a program whose time had come. Increased availability of large consumer durables such as passenger cars is needed to abate the inflationary pressures generated by steady growth in spendable personal income and to increase worker incentives. Moreover, a small and backward passenger car industry is inconsistent with the status of

[1] Output of motor vehicles in Japan during the past decade grew at an average annual rate of 36 percent.

the USSR as the world's second most powerful industrial nation. In 1970 the USSR had only 7 cars for each 1,000 of the population compared to 439 in the United States, 85 in Japan, and 200 to 300 in the car producing countries of Western Europe (See Table 2). Moreover, less than one-half of total Soviet inventory of passenger cars in 1970 was owned by private citizens.

TABLE 2.—MOTOR VEHICLES IN USE PER 1,000 PERSONS IN THE USSR AND SELECTED NON-COMMUNIST COUNTRIES—1970 [1]

	Population (millions)	Registrations (thousands)			Vehicles per 1,000 persons	
		Cars	Trucks and buses	Total	Cars	Total
U.S.S.R.	241.7	1,650	4,600	6,250	7	26
Canada	21.4	6,602	1,481	8,083	308	378
France	50.8	12,290	2,115	14,405	242	284
Italy	53.7	10,209	929	11,138	190	207
Japan	103.5	8,779	8,803	17,581	85	170
Spain	33.3	2,382	748	3,130	72	94
Sweden	8.0	2,288	159	2,446	286	306
United Kingdom	55.7	11,792	1,910	13,702	212	246
United States	203.2	89,280	19,127	108,407	439	533
West Germany	59.6	14,376	1,228	15,604	241	262

[1] Derived from official statistics of the U.S. Department of Commerce and "1972 Automotive Facts and Figures," a publication of the Motor Vehicle Manufacturers Association of the United States, Inc., Washington, D.C., pp. 28, 29.

During 1971–75, a total of 4.7 million cars will be produced, and about 55 percent of these will be sold to private owners. However, sales to consumers as a share of total output are increasing each year and by 1975 will be about three-fifths. Most of the remainder will be used by the government for official purposes and to expand the taxi fleet, although a sizeable number of cars also will be exported to Eastern Europe in payment for automotive parts supplied to the Tol'yatti plant. After 1975 the USSR plans to sell large numbers of cars in non-Communist countries, particularly in Western Europe. These sales will constitute a new source of hard currency earnings and, equally important from the Soviet point-of-view, enhance the image of the USSR as a modern industrialized economy.

Expansion of Plant Capacity

Large increases in passenger car output are possible during 1971–75 because the Tol'yatti plant has come on-stream and is rapidly moving toward capacity output and because new production capacity was added during 1966–70 to the Moscow and Izhevsk passenger car plants. About $700 million was spent in the West for equipment and technology for these plants. Together these three plants will produce 1 million cars a year by 1975 and account for about 95 percent of the total increase in output during 1971–75 (See Tables 3 and 4). Major Soviet producers of passenger cars are discussed below.

TABLE 3.—SOVIET PASSENGER CAR PRODUCTION BY PLANT AND MODEL, 1965–72 AND ESTIMATES FOR 1975 [1]

[In thousands of units]

Plant location	Plant name	Model produced	1965	1966	1967	1968	1969	1970	1971	1972	1975
Tol'yatti	Volga Motor Vehicle Plant (VAZ).	Zhiguli	0	0	0	0	0	22	172	320	600
Moscow	Moscow Motor Vehicle Plant (AZLK).	Moskvich	72	77	83	84	83	98	85	110	200
Zaporozh'ye	Zaporozh 'ye Motor Vehicle Plant (ZAZ).	Zaporozh'ye	41	52	65	78	79	87	92	96	135
Izhevsk	Izhevsk Motor Vehicle Plant (ZIMA).	Moskvich	0	0	2	8	14	20	70	94	200
Gor'kiy	Gor'kiy Motor Vehicle Plant (GAZ).	Volga	54	58	60	68	72	70	65	65	75

[1] Derived from official Soviet statements.

TABLE 4.—SOVIET PASSENGER CAR PRODUCTION BY MODEL, 1972 AND ESTIMATES FOR 1975

[In thousands of units]

Model	Production		Percent of total	
	1972	1975	1972	1975
Zhiguli	320	600	44	48
Moskvich	204	400	28	32
Zaporozhets	96	135	13	11
Volga	65	75	9	6
Other [1]	45	50	6	4

[1] Mostly jeep-type vehicles and limousines.

Tol'yatti: The Volga Motor Vehicle Plant (VAZ) at Tol'yatti is by far the largest and most modern passenger car plant in the USSR. Built under a 1966 agreement with Fiat of Italy, it is also the largest cooperative project ever undertaken by a Western firm and a Communist country. Designed by Fiat and built at a cost of $1.5 billion (1965 dollars), the plant employs up-to-date machinery and technology purchased in the West for about $550 million. Most of the machinery, which was specified by Fiat, was purchased in Italy and in other countries in Western Europe under credits provided by the Italian State Bank, Institute Mobiliare Italiano. About 10 percent of foreign expenditure was made in the United States for technology, licenses, and equipment. The Tol'yatti plant has been designed to produce 600,000 cars a year on two shifts. However, the Soviets are pushing hard to produce 660,000 cars a year by 1975 or at a level 10 percent above the plant's designed capacity, probably by running extra shifts or speeding up the assembly lines. The USSR plans to expand the Tol'yatti plant to perhaps twice its present size at some time in the future. Some of this work may be accomplished during 1976–80, probably with further assistance from Fiat.

Tol'yatti is a highly integrated production facility that combines all basic production processes at one site: casting (foundry), forging, stamping and pressing, engine production, assembly, and tooling. In addition, a large spare parts storage and distribution center is in operation at the site to provide spare parts to repair stations and outlets across the country.

Components and parts not produced at Tol'yatti are supplied to it by a system of vendor plants, most of which also have been newly constructed, many with assistance from Western firms. These includes: a rubber fittings plant at Balakovo built with the technical assistance of Pirelli of Italy; plants for making oil and air filters and upholstery materials, purchased from Japan: a plant for car seats from West Germany; a plant for oil seals at Kursk; and an anti-friction bearing plant at Vologda. In addition, countries in Eastern Europe are supplying a large array of parts and components under 5-year cooperative agreements and are receiving payments mainly in finished cars. Poland and Yugoslavia, which also build Fiat cars, are supplying dozens of different small parts. Hungary is supplying car radios, dashboards and electrical fittings; Bulgaria is supplying batteries.

The industry is training workers on a massive scale to operate the production lines at VAZ. At capacity (two shifts) the plant will employ between 50,000 and 60,000 workers. Scores of engineers and technicians have been trained by Fiat in Italian plants, and hundreds of line workers have trained at other Soviet plants, mainly in the Gor'kiy area. A large training facility at VAZ is staffed with personnel from technical schools in the area and with specialists from the VAZ cadre.

Moscow: The Moskvich Motor Vehicle Plant (AZLK) in Moscow was for many years the largest producer of passenger cars in the USSR until superseded by Tol'yatti in 1971. The plant recently was redesigned and expanded to a capacity of 200,000 a year—more than twice its former size—under a technical assistance contract with Renault of France. Full operation of the new facilities, scheduled initially for 1970, was not achieved until 1972, partly because the project had to compete with Tol'yatti for construction materials and labor. Now principally an assembly facility, the plant is dependent upon a large number of specialized supplier plants for components and parts, including the Ufa Engine Plant for motors and a new plant in Kineshma for castings and other parts and materials. The remodeled plant now builds the recently redesigned Moskvich–412 and its station wagon version, the Moskvich–427. Further expansion, to 300,000 cars a year, is planned for the future.

Izhevsk: The city of Izhevsk in the Urals, long noted as a center of Soviet motorcycle production, now has become an important car building center as well. A large new passenger car facility, the Izhevsk Motor Vehicle Plant (ZIMA) was completed in 1971. Built with capacity for the production of 220,000 cars a year, the plant is to be further expanded to produce 300,000 cars a year at some time in the future. Like the Moscow plant, Izhevsk also was designed and equipped by Renault of France to produce Moskvich cars and station wagons. The plant is equipped with Renault-built stamping presses for making body parts, US-built machine tools for making differential gears, and with other Western equipment.

Zaporozh'ye: The Zaporozh'ye Motor Vehicle plant (ZAZ), which builds the smallest and least expensive of the Soviet cars—the Zaporozhets—is the least efficient and most negelected car producer in the USSR. Converted from an agricultural machinery plant in the 1950's, it is to be expanded to produce 135,000 cars a year by 1975. This goal is 10 percent below that originally planned for 1970 (150,000). Because investment funds were insufficient and skilled labor was scarce, the plant during the Eighth 5-Year plan failed to meet both construction and output goals. Unlike most of the other plants in the industry, Zaporozh'ye has not received technical assistance and equipment from the West. Moreover, its domestic supplier system works poorly. The Melitopol Engine Plant that supplies the ZAZ air cooled engines often fails to meet delivery schedules and supplies an inadequate quantity of spare parts for engine repairs. Because of other delivery failures, ZAZ has been forced to build some parts in crowded shops ill-suited for that purpose. In 1972 the plant produced

96,000 cars, an increase of only 10 percent over 1970. ZAZ will have to more than double that production rate to achieve even the reduced goals for 1975.

Gor'kiy: The Gor'kiy Motor Vehicle Plant (GAZ), primarily a builder of trucks, also produces the Volga car (GAZ–24), the most expensive of the passenger cars in mass production. Unlike the other car plants, the Volga facilities are not being expanded. GAZ is focusing instead on improvements in quality and design. Production lines for the Volga recently were modernized and newly equipped using some machine tools and a new conveyor system from the West.

Car Models

Only four types of cars are in mass production in the USSR: the Volga, produced by the Gor'kiy plant; the Moskvich, produced by the Moskvich and Izhevsk plants; the Zhiguli,[2] produced at Tol'yatti; and the Zaporozhets, produced by the Zaporozh'ye plant. Most of the cars in production are standard sedans, although some station wagons are produced by all but the Zaporozh'ye plant. Only the Zhiguli is built in three models: the VAZ–2101 standard sedan and VAZ–2102 station wagon (copies of the Fiat–124) and the VAZ–2103 deluxe sedan (copy of the Fiat–125). In 1972 total output of all makes amounted to 685,000 units as follows:

Make and model	Description	Output
Volga		65,000
Moskvich		204,000
Zaporozhets		96,000
Zhiguli:		
VAZ–2101	Standard sedan	300,000
VAZ–2102	Station wagon	10,000
VAZ–2103	Deluxe sedan	10,000

All cars in mass production in the USSR have 4-cylinder engines and are smaller than US cars except for the subcompact class. The Zhiguli (60-horsepower) resembles the Chevrolet Vega in size but has less engine power. The Volga is slightly larger in size and engine power and is more luxurious but very expensive. The tiny Zaporozhets with a 40-horsepower engine is about the size of the Fiat 850. Until recently Soviet-made passenger cars were underpowered because engines were designed with low compression ratios in order to use inexpensive low octane gasolines (ratings in the 70's and 80's were standard). Now that higher octane fuels are more plentiful, the industry is using higher compression engines (8.2 to 1 or above) in all passenger cars except the Zaporozhets to provide more power and better engine performance. Most models now use 93 octane gasoline. The Zaporozhets uses 76 octane gasoline and ZIL limousines, 98 octane. Table 5 shows the principal characteristics of cars built in the USSR.

[2] The export model is called Lada.

TABLE 5.—PRINCIPAL CHARACTERISTICS OF PASSENGER CARS BUILT IN THE USSR[1]

Model	Number of passengers	Weight (pounds)	Horsepower	Top speed (miles/hour)	Engine displacement (cubic inches)	Compression ratio	Cylinders	Gasoline type (octane rating)
Cars in mass production:								
Volga (GAZ-24)	5-6	3,080	98	90	149.2	8.2	4	93
Moskvich (412)	4	2,200	75	87	90.2	8.8	4	93
Zhiguli (VAZ-2101)	5	2,079	60	87	73.0	8.8	4	93
Zaporozhets (968)	4	2,376	40	74	73.0	7.2	4	76
Limousines:								
Chaika (GAZ-13)	7	4,620	195	100	336.8	8.5	8	93
ZIL-114	7	6,787	300	118	424.6	9.5	8	98

[1] Kratkiy avtomobil'nyy spravochnik, Moscow 1971, passim.

All Soviet cars now in production are relatively new models that incorporate modern Western styling. In external appearance they are vastly improved over earlier models. The Volga and Zaporozhets, though copied after Western models, were wholly designed by the Soviets. Renault helped with the design of the Moskvich, and the Zhiguli, designed in Italy, is virtually a replica of the Fiat-124. All cars, with the exception perhaps of the Zaporozhets which is not highly esteemed in the USSR, also are of somewhat higher quality than previous models. The Zhiguli, in addition, has been modified and strengthened to stand up under rougher Soviet road conditions and has been adapted for colder winters. However, Soviet-made cars generally do not meet the high standards for quality and dependability of Western cars. Metal surfaces are not as even,[3] paints and other finishes are not as long-lasting, and engines have to be repaired more frequently.

Prices and Sales

Prices for current model Soviet cars in rubles and in dollars are as follows:

Car name and model	Price	
	Rubles	U.S. dollars[1]
Volga, GAZ-24	9,000	12,000
Zhiguli, VAZ-2101	5,500	[2] 7,400
Moskvich, Moskvich-412	4,936	6,600
Zaporozhets, ZAZ-968	3,510	4,700

[1] Rounded. Converted at the rate of 1 ruble equals $1.34.
[2] This model is sold in Western Europe for about $2,000.

Prices of these new model cars are very high relative to domestic consumer purchasing power. For example, wages of Soviet workers in 1972 averaged 130 rubles per month or about 1,600 rubles per year. Thus, the price of a Zhiguli is equivalent to nearly two years total earnings for an average family with two incomes. By comparison, a moderately priced car in the US in 1972 was equivalent to about six months earnings for an average industrial worker. The price of the

[3] The stamping of body parts such as fenders and roofs requires the use of high grade flat rolled steel of good deep drawing quality. Soviet-made steel often does not meet these standards, and defects (wrinkles and roughness) in the surfaces result.

Volga is particularly exorbitant and out of reach of the average Soviet citizen. The price also appears to bear little relation to the cost of production—it is about 60% higher than the price of the model it replaced. Possession of a Volga at this extraordinary price serves to differentiate high income earners in a society in which individual status is otherwise obscured.

Soviet passenger cars must be purchased in cash; no cars are sold on credit. Buyers may pay in one lump sum or make periodic downpayments up to the time of delivery. Whatever the arrangement, the car must be fully paid-up at delivery.

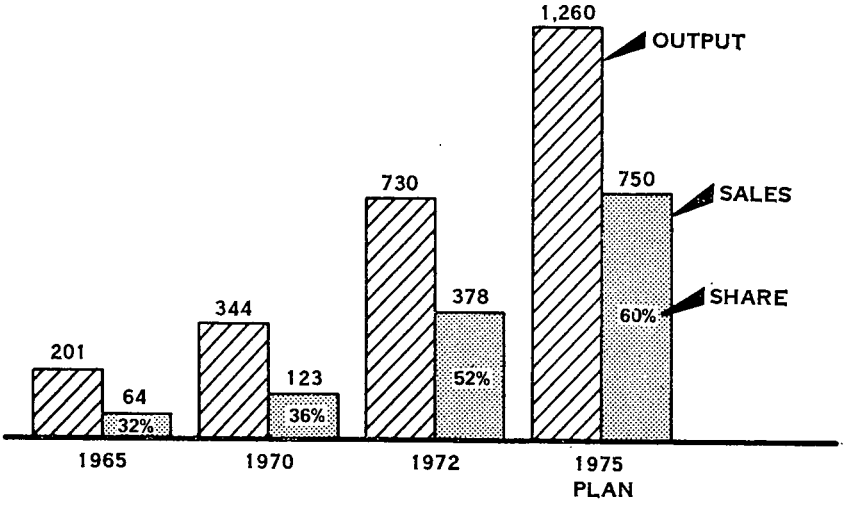
Used cars also command high prices on the Soviet market, although they are priced well below new models. For example, a used Moskvich in 1972 cost about 3,700 rubles compared to nearly 5,000 rubles for a new model. In addition to the lower prices, buyers are attracted to the used car market by the prospect of relatively quick delivery. Whereas buyers must wait from two to three years for delivery of new cars, used cars are delivered within six months to one year.

Under a recent regulation designed to reduce black market sales, car owners now are allowed to sell their cars privately. However, the transaction must be registered and the seller must pay the government a fee equal to 7% of the sale price. In private sales, the buyer pays a price somewhat higher than that in the government-regulated used car market, but possession is immediate—a feature that is particularly attractive to the long-denied Soviet citizen.

During 1971–75, the USSR plans to supply 2.6 million cars for sale at retail. By 1972 the annual level of sales already had climbed to 377,000, nearly six times as many as were sold in 1965 (64,000). In 1975 retail sales are planned to rise to 750,000 units, about double the 1972 level (See Figure 2 and Table 10).

FIGURE 2.

Soviet Passenger Cars Retail Sales as a Share of Output



Growth in Private Ownership

As a result of the burgeoning growth in retail sales, private ownership of cars in the USSR now exceeds government ownership. In 1970 about 800 thousand cars, less than 50% of all the cars in use, were privately owned. By 1975 three million cars, or about two-thirds of all cars in use, will be in private hands. According to official Soviet statistics, the number of cars "in private use" was 1.5 million in 1970. However, official statistics are misleading because the rubric "in private use" includes a very large number of cars (700,000 in 1971) that are state-owned but are assigned to officials for both public and private use.

Estimated distribution of ownership in thousands for 1970–72 and 1975 is shown in the tabulation below.

Year	Inventory [1]	Private [2]	State			
			Assigned to officials [3]	Taxis [4]	Other State use [5]	Total
1970	1,700	800	700	90	110	900
1971	2,000	900	850	100	150	1,100
1972	2,400	1,250	850	110	190	1,150
1975	4,700	3,000	1,000	180	520	1,700

[1] Estimates based on output adjusted for exports and retirement.
[2] Estimates based on retail sales adjusted for retirement.
[3] Derived from Soviet data on cars in private use minus figures in 2d column (estimated for 1972 and 1975). Official data on number of cars in private use has been given as follows: 1970—1,500,000 (Sovetskaya Latvia," Jan. 30, 1972); 1971—1,800,000 ("Economicheskaya gazeta," No. 37, September 1972).
[4] Avtomobil'nyy transport No. 4, 1971, p. 3, and "Narodnoye khozyaystovo SSSR," 1922–72, p. 31.
[5] Residual.

Although figures for private car ownership in the USSR are impressive in view of the historic neglect of the consumer, they also are misleading. As long as prices remain high compared with income levels and time payments are not allowed, the "average" Soviet citizen will share unequally in the new affluence. Only the professional and managerial elite who have accumulated sufficient savings to pay the high price in cash can likely afford a new car in the foreseeable future.

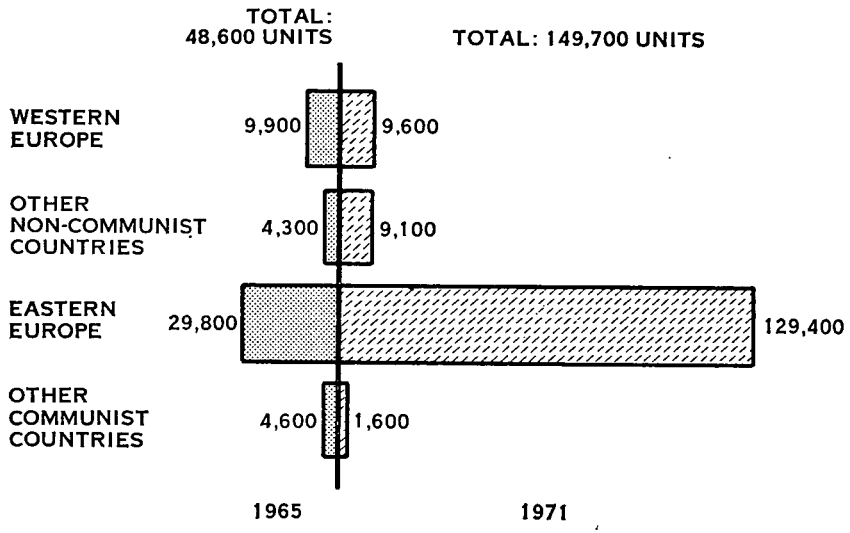
Soviet Cars and Foreign Markets

The USSR is exporting an increasing share of its passenger car production and no longer imports any passenger cars. Exports represented 24% of output in 1965 but 28% in 1971. More than four-fifths of all car exports at present go to the Communist countries of Eastern Europe. Increasingly, cars are being exported to Eastern Europe in payment for automotive components and parts supplied to the Tol'yatti plant. In 1971 Bulgaria, Czechoslovakia, East Germany, and Hungary each received 20,000 to 30,000 cars from the USSR; Poland, Rumania, and Yugoslavia 1,000 to 6,000 each (See Table 6 and Figure 3).

The USSR also is interested in expanding sales in Western Europe. In 1971, 9,600 cars were exported to Western Europe: 4,400 to Finland, 1,100 to the Netherlands, and amounts ranging from 200 to 800 to other countries. Shipments to Western Europe in 1971 represented only 6% of total Soviet passenger car exports. The USSR operates two marketing firms in Western Europe: Scaldia-Volga in Brussels (since 1964), and Konela in Helsinki (since 1967). Because

FIGURE 3

Soviet Exports of Passenger Cars in 1965 and 1971



the Soviet Moskvich and Volga models being marketed have had little attraction to Western European buyers, neither firm has been very successful. Sales through Scaldia-Volga have been particularly slow and, in fact, have declined from 1,700 units in 1966 to 535 in 1971.

TABLE 6.—SOVIET EXPORTS OF MOTOR VEHICLES BY GEOGRAPHICAL AREA[1]

[In units]

Motor vehicles and year	Total	Eastern Europe	Other Communist countries	Western Europe	Other non-Communist countries
Cars:					
1965	48,600	29,800	4,600	9,900	4,300
1968	82,300	64,200	1,700	8,300	8,100
1970	84,300	65,000	1,400	8,300	9,600
1971	149,700	129,400	1,600	9,600	9,100
Trucks:					
1965	15,100	5,200	4,300	200	5,400
1968	29,100	13,200	7,000	600	8,300
1970	34,400	16,000	7,600	1,000	9,800
1971	31,700	13,000	6,100	1,500	11,100
Buses:					
1965	597	302	66	113	116
1968	1,158	364	199	222	373
1970	1,400	247	193	510	450
1971	2,200	280	223	426	1,271

[1] Official annual Soviet trade handbook, "Vneshnaya torgovlya SSSR," for all years.

The USSR now is attempting to develop markets for its new Zhiguli (Lada) through Scaldia-Volga and Konela. Moreover, in 1972 the Ministry of Foreign trade hired a market research firm in Austria (with branches in Paris and Munich) to assess market prospects for Soviet cars in Western Europe for the period 1975 to 1980. The Lada

should be better able to compete in Western markets than other Soviet cars because of its better quality and popular Italian design. Moreover, because it is a Fiat-designed product, it can be serviced by Fiat dealers throughout Western Europe. Adequate maintenance and servicing for Soviet-made cars has always been a bottleneck to the Soviet export program. Furthermore, the Lada is priced to compete with Western built cars including the Italian-made Fiats.

Service Facilities

The existing network of automotive service facilities in the USSR, including both filling stations and repair garages, has been described by *Izvestiya* as "primitive", serving less than one-third the country's needs. For example, Moscow's 100,000 privately owned cars presently are serviced by only 12 filling stations and three repair garages. The country's entire inventory of 800,000 privately owned cars is served by only 370 repair garages, or one garage for each 2,200 cars. Many cities have few, if any, repair facilities. Under the current program of expanded output and sales to private individuals, about one million new cars a year will be added to the passenger car inventory by 1975, swelling the demand for service facilities to overwhelming proportions.

During 1971–75, the network of repair facilities is being expanded. Most nations will be larger and provide a wider range of services than those now operating. According to the Ninth Five-Year Plan Directives, 33 sales and service centers are planned for Zhiguli cars alone to provide new car warranty service and repair. These stations, scheduled for completion in 1973, will be among the largest stations to be built in the USSR with a capacity for handling about 50 cars per station at any one time. Overall, 600 repair centers (including the Zhiguli centers) are to be built, providing a total work space for 8,500 cars, an average of 14 work spaces per station. In 1972 nearly half the repair garages in operation had work space for less than five cars. Stations are being designed in 6 basic configurations and sizes; those with 25 to 50 work spaces will operate in conjunction with sales offices. Repair facilities are to be built at a cost of 580–600 million rubles. Several thousand filling stations also will be built during 1971–75.

The number of repair centers and filling stations in existence and planned is as follows:

Type of facility	Total in 1970	Planned for 1971–75	Total in 1975
Repair centers	370	600	970
Filling stations	2,000	[1] 4,000	6,000

[1] Estimate. 2,500 in the RSFSR.

Construction of repair facilities is progressing very slowly and only about half of the construction funds allocated to the program were used during 1971 and 1972. Ministry officials claim that 670 repair stations were servicing private cars in 1972, but many of these are temporary shops hastily set up to meet pressing needs. Only a few of the 33 VAZ centers are likely to be in operation by the end of 1973 as

scheduled. Hence, the VAZ management has made special *ad hoc* arrangements in many areas to provide warranty service for Zhiguli cars. In fact, VAZ is permitting Zhiguli's to be sold only in areas where factory authorized servicing can be carried out.

The USSR has made a special effort to publicize its new program for automotive service by building gigantic showplace centers in several locations for sales and service of all makes of Soviet cars. The largest, Moscow's 3 million ruble automotive center located on the Warsaw Highway near the city's beltway, was about half finished in early 1973. Other centers, on the Minsk Highway in Mosow and at Yakhroma to the north, also are partially built but are far behind schedule. In Tbilisi in southern Georgia, a new sales and service center began partial operation in 1973, the only large center known to be open thus far.

When present plans for the service network are realized, motorists in the USSR will find service available on main highways and in the large cities, but still almost non-existent in smaller cities, towns, and rural areas. By 1975 there is to be one filling station for every 24 miles of main highway on the average, compared with 36 in 1970, and one repair station for every 37 miles, compared with 121 in 1970.

The Truck Program

Modernization of the Soviet truck industry, underway since about 1968, is long overdue. Since the Soviet truck industry was established more than 40 years ago with US technical assistance,[4] all Soviet truck models have incorporated US design, and production technology has been patterned after US practice. However, during the past two decades Soviet truck design and technology have undergone few changes and still compare in general with that of the US in about 1950. For example, the GAZ–51 cargo truck has been in continuous production without major modification at the Gor'kiy plant for 24 years. Although scheduled to be replaced by an improved model in 1965, it continues to be produced in greater quantity than any other Soviet medium-sized truck.

Unlike US and Western practice where trucks models number in the hundreds, the USSR produces trucks in only eight basic models. Most are medium-sized types with cargo-carrying capacities of 2.5–5 tons, too large for a wide range of intracity commercial and institutional uses and too small for intercity hauling. Soviet trucks also are built with almost no optional equipment, whereas US truck builders offer a wide variety of options including a choice of gasoline or diesel engines in various sizes and makes and a dozen or more different transmissions. Moreover, most Soviet-made trucks are underpowered, are heavy relative to their cargo-carrying capacity, and hence, are relatively inefficient in use and costly to operate. Soviet truck manufacturing techniques also are outdated. Computer-assisted control systems for management and production, which typify US practice, still are rare in Soviet truck plants. Automated equipment is in wide use, but much of it is out of date by Western standards.

[4] The first major Soviet truck plant was established at Gor'kiy in 1932 using the architectural drawings of the Ford River Rouge Plant, technical advice of Ford engineers, and machinery and equipment for producing the Ford Model-A truck which, by then, was obsolete.

Goals

In 1970, the USSR produced 525,000 trucks in 8 assembly plants. Output from these facilities is planned to rise to 765,000 units in 1975, an increase of about 46%. In particular: output of light utility type vehicles of 1-ton capacity is being rapidly expanded from 10,000 units in 1970 to a planned level of 60,000 units in 1965, a five-fold increase, and output of medium-size trucks—2.5 to 5 tons—is to increase 40%. Production of heavy-duty 3-axle trucks of 8–11 ton cargo capacity is to begin in 1975 and reach 150,000 units a year at capacity, probably in the late 1970's. To carry out this program, production capacity is being expanded at Ul'yanovsk (for light trucks) and at the Gor'kiy and Moscow Likachev plants (for medium trucks) using both process technology and equipment imported from the West. Firms in the US already have supplied sizable amounts of automated transfer machinery; machine tools for making differential gears, wheel hubs, and brake drums; overhead conveyor systems; and computer control systems.

The Kama Complex

To produce heavy-duty transport trucks, the USSR is building the world's largest heavy truck plant at Naberezhnyye Chelny on the Kama River 600 miles east of Moscow. At capacity, this plant will produce 150,000 3-axle trucks a year and 250,000 diesel engines.[5] By comparison, the United States in 1971 built 93,000 trucks with 3 or more axles. The Kama complex comprises six major production plants, extensive support facilities, and housing for an eventual labor force of 80,000. Although slated for completion in 1974, construction work is at least one year behind schedule. At the end of 1972, only about half of the construction work had been completed.

The Kama plant is being built at a cost of 3 billion rubles or more than $3.3 billion at the official rate of exchange.[6] Of this amount, about $1 billion will be spent on machinery and equipment for the 6 major facilities, as follows:

Major facility	Estimated value of machinery and equipment	Percent of total
Engine, gear, and transmission	$450	44
Foundry	250	25
Assembly	150	15
Pressing and stamping	100	10
Forge	50	5
Tooling and repair	15	1

[5] Three basic variants of the truck will be built at the following rates when capacity output is reached:

	Units per year
(1) Truck with standard body (stake and platform) which also can pull a trailer, combined capacity up to 16 tons	30,000
Its variant with an extended chassis	25,000
(2) Truck tractor for pulling semi-trailer up to 20 tons capacity	55,000
(3) Dump truck with 7-ton capacity	40,000

The Kama truck engine, the YaMZ–740, is a four stroke, direct injection engine, a modification of the diesel engines built for Kremenchug and Minsk trucks. They are V-form engines of 180, 210, and 260 horsepower.

[6] 1970 dollars. One ruble is equal to $1.11.

The plant is being built with extensive foreign assistance, though the foreign input is somewhat less than the Soviets had originally planned.[7] About three-fourths of all the machinery, equipment, and technology for Kama—about $750 million—will come from Western suppliers. Major portions of the engineering and design work for the two largest facilities—the engine plant and the foundry—have been subcontracted to Renault of France, and to a large US engineering firm, respectively. In both cases, the subcontractor is specifying equipment suppliers and providing much of the equipment. The foundry, in particular, will represent a major technological gain for the USSR. Designed and built for a major US automotive firm around 1970, the foundry embodies advanced processing technology and equipment that is not available in this form outside the United States. In particular, it includes a highly automated casting process that has been of interest to the USSR for several years.

The Free World countries supplying equipment for Kama and types of equipment being supplied are summarized below:

Country:	*Type of equipment*
United States	Foundry design and equipment (electric arc furnaces, holding vats and molding lines); gearmaking machines.
West Germany	Machinery for making transmissions; forging presses.
France	Engine plant design and part of the equipment; paint lines; welding lines.
Italy	Conveyor systems.
Japan	Press lines; transfer presses.

The Production Base

Two large truck building plants, in Gor'kiy and Moscow, which specialize in medium (2.5 to 5-tons) cargo trucks build 80% of the trucks produced in the USSR. The Kutaisi plant in the Georgian SSR also builds trucks in this class. All other truck plants are relatively small (less than 30,000 units a year), and specialize in building light service trucks, heavy transport trucks, and large off-highway dump trucks. Light trucks, of one-ton capacity or less, are made at Ul'yanovsk; heavy transport trucks, of 7.5 to 14-ton capacity, at plants in Minsk, Kremenchug, and Miass; and off-highway or quarry vehicles, 27-ton capacity and above, at the Belorussia plant (BelAZ) in Zhodino. Modernization and expansion programs in Soviet truck plants are discussed below. Table 7 shows Soviet truck production by major plant and Table 8 gives descriptions of Soviet trucks.

Gor'kiy: The Gor'kiy Motor Vehicle Plant (GAZ), the largest of the truck producers, built 310,000 trucks in 1972, more than one-half of total output. The plant has maintained a high level of output by keeping standard models in production for more than 20 years with very few modifications. The basic model trucks in production are the GAZ–51 and the all-wheel-drive GAZ–63. Replacement of these models by the more modern GAZ–53 and GAZ–66, scheduled originally for 1963,

[7] Initially the USSR had sought the assistance of a large Western truck manufacturer to help design and manage the construction of the entire project as Fiat of Italy had done at Tol'yatti. Because of the implied commitment of technical resources and the uncertain return on investment, Western respondents declined participation on such a broad basis.

TABLE 7.—SOVIET TRUCK PRODUCTION BY MAJOR PLANT

[In thousands]

Producer	Cargo capacity in metric tons	Estimated output [1] 1970	1971	1972	Plan [2] 1975
Light: Ul'yanovsk (UAZ)	1	10	15	23	60
Medium:					
Gor'kiy (GAZ)	2.5, 4	272	297	310	380
Moscow (ZIL)	5	144	150	155	200
Kutaisi (KAZ)	4.5	14	15	18	22
Heavy:					
Minsk (MAZ)	7.5	26	28	29	30
Kremenchug (KAZ)	12, 14	20	20	24	24
Miass (Urai)	7.5	16	16	16	16
Off-highway:					
Zhodino (BelAZ)	27, 40	3	3	3	3
Other [3]		20	20	20	30
Total		525	564	598	765

[1] Estimates derived from annual production statistics of the individual Soviet Republics and from information on the individual plants.
[2] Derived from official statements.
[3] Bryansk, Yerevan, Saransk, and Frunze.

TABLE 8.—CHARACTERISTICS OF PRINCIPAL TYPES OF SOVIET TRUCKS [1]

Model and type	Axle configuration [2]	Load capacity (metric tons)	Type of engine	Number of cylinders
GAZ-51, standard	4×2	2.5	Gasoline	6
GAZ-53, standard	4×2	4.0	do	V8
GAZ-63, heavy duty	4×4	2.0	do	6
GAZ-66, heavy duty	4×4	2.0	do	V8
ZIL-130, standard	4×2	5.0	do	V8
ZIL-131, heavy duty	6×6	3.5	do	V8
URAL-375, heavy duty	6×6	5.0	do	V8
URAL-377, standard	6×4	7.5	do	V8
MAZ-500, standard	4×2	7.0	Diesel	V6
MAZ-504, tractor trailer	4×2	11.0	do	V6
KrAZ-255, heavy duty	6×6	7.5	do	V8
KrAZ-257, standard	6×4	12.0	do	V8
BelAZ-540, off-highway	4×2	27.0	do	V12
BelAZ-548, off-highway	4×2	40.0	do	V12
KAZ-608, truck tractor	4×2	10.5	Gasoline	V8
UAZ-452, standard	4×4	.8	do	4

[1] Kratkiy avtomobil'nyy spravochnik, Moscow, 1971, passim.
[2] 1st digit indicates the number of wheels and the 2d digit indicates the number of wheels that transmit power. For example, a 4×4 or 6×6 is an all-wheel-drive truck.

now is to be accomplished by 1975. However, a small number of these newer models have been built each year since the late 1960's.

GAZ is pushing hard to achieve a 40% increase in output by 1975. To provide the needed production space, all of the component production (engine, transmissions, and parts) except axles has been or is being transferred to specialized facilities. Axle production is to be expanded at GAZ in a new shop now being set up. Axle production could be a bottleneck to the achievement of 1975 output for GAZ trucks because some of the production equipment cannot be delivered by Soviet machine tool producers until 1974.

Moscow: The Moscow Motor Vehicle Plant named Likachev (ZIL) is only half as large as GAZ, but is the most modern plant in the Soviet truck industry both in organization, production technology, and vehicle design. ZIL assembles trucks and produces engines. It is supplied with pistons, wheels, transmissions, steering assemblies, brake systems and

other parts by specialized suppliers. ZIL has acquired more advanced equipment and process technology from the West than any of the existing Soviet truck plants. Much of the equipment purchased abroad for ZIL's supplier plants is from the United States. ZIL presently is arranging to buy in the US an overhead conveyor system and a large computer system for the main plant. A new assembly plant is being constructed and is scheduled to be completed in time to expand ZIL's output capacity to 200,000 trucks a year by 1975, an increase of about one-third over 1970. ZIL's outstanding engineering staff designed the ZIL–130 medium cargo truck and the 3-axle, all-wheel-drive ZIL–131, the most modern Soviet trucks in mass production. In addition, ZIL engineers designed the heavy transport truck to be built at the Kama Truck Complex.

Ul'yanovsk: The Ul'yanovsk Motor Vehicle Plant (UAZ), which is scheduled to become the country's major producer of light service trucks, is increasing output very slowly and may fail to reach the 1975 output goal of 60,000 trucks a year. In 1972 the plant built 16,000 of its newest model, the UAZ–452 which is a panel truck mounted on a jeep chassis. When the building program finally is finished, the plant will be able to build 150,000 a year. UAZ also specializes in building military jeeps (counted as passenger cars), a function it took over from the Gor'kiy plant in 1966. Its new jeep, the UAZ–469 was put in production in January 1973 as a replacement for the outmoded GAZ–69, but since it was designed in 1963, is itself obsolete by Western standards.

Minsk: The Minsk Motor Vehicle Plant (MAZ) in Belorussia is the largest producer of heavy duty cargo trucks in the USSR. All are cab-over-engine type, powered by V6 180 horsepower diesel engines. Cargo-carrying capacities range from 4.5 tons (2-axle) to 14 tons (3-axle). However, this plant cannot be expanded and the Soviets are considering construction of a new plant in the Minsk area to expand production of MAZ models.

Kremenchug: The Kremenchug Motor Vehicle Plant (KrAZ) in the Ukraine also builds heavy cargo trucks of 12- to 14-ton load-carrying capacity and a truck trailer that pulls a semitrailer with a pay load of 30 tons. Kremenchug vehicles are 3-axle trucks powered by V8 240 horsepower diesel engines. Converted from an agriclutural machinery plant in 1958, the plant has gradually raised output to the current level of about 25,000 trucks a year. KrAZ trucks are not well designed for general purpose transport. Developed from US Army heavy prime movers supplied under lend-lease in World War II, they continue to be built without major modification. KrAZ trucks are used as military prime movers, for towing heavy industrial and construction equipment, and as dump trucks. Although the Kremenchug plant is not being modernized or expanded, it will continue to be one of the principal suppliers of trucks in the heavy class even after the Kama complex is in operation.

Kutaisi: The Kutaisi Motor Vehicle Plant (KAZ), located in the Georgian SSR, builds cab-over-engine truck tractors (4 x 2) with trailer designed for hauling general cargo weighing up to 15 tons. A building program now under way includes new engineering offices, shops for producing trucks parts and trailers, and additional assembly space to permit a 10% increase in truck output by 1975.

Miass: The Ural Motor Vehicle Plant, built in Miass in the Ural Mountains during World War II, now specializes in building 3-axle heavy cargo trucks in two basic models: the Ural–375, a 5-ton cargo carrier, is principally a military truck designed for transport operations over rough terrain; the Ural–377, is used for general purpose hauling of loads up to 7.5 tons. A program to expand the Ural plant beyond its present 16,000 unit capacity has made little progress. Construction has been slow on shops for making steel castings and for stamping body parts. The plant, already operating at full capacity, cannot increase output further until the new facilities are completed.

Zhodino: The Belorussia Motor Vehicle Plant (BelAZ) at Zhodino specializes in heavy off-highway dump trucks for the mining and construction industries. Annual output is now about 3,000 units a year. Two models are in production: the 27 metric ton BelAZ–540 and 40 metric ton BelAZ–548. Trucks with 75 and 120 tons capacities are under development. Production of such trucks may be several years off because the USSR does not now have the capability to produce the large automotive diesels and power trains for such large size units.

Truck Engines

A major deficiency of the Soviet truck industry has been the failure to produce high performance diesel engines. Most Soviet trucks, including all of the medium and light trucks and some of the heavy trucks, are powered with gasoline engines. Only heavy cargo trucks and off-highway trucks are diesel powered. Most gasoline engines use low octane fuel; late model engines use 76 octane gasoline, earlier models, 72 octane. Because they are designed for use with low octane gasolines, truck engines have low compression ratios of about 6.5 to 1. Because of excessive body and chassis weight, engines generate insufficient power, fuel consumption is high, and work performance low. To improve performance and reduce operating costs, Soviet officials plan to make more extensive use of improved diesel engines in medium as well as in heavy trucks.

Production of diesel engines is centered at the Yaroslavl' Engine Plant (YaMZ) that has developed and built diesel engines since about 1950. It builds V6 and V8 diesel engines and some transmissions and clutches primarily for heavy trucks produced at Minsk, Kremenchug, and Zhodino. It also has designed the engines to be produced by the Kama Truck Plant. These engines have been under intensive road tests for the past two years. Yarosolavl' engines, although continually being improved, still do not come up to US standards of performance. They are heavy, are made of inferior metals, and have excessive tolerances between moving parts. Their fuel consumption is high, and repairs are needed often. The USSR has enlisted the help of Western specialists in engine design to help alleviate these problems. Renault engineers began working with Soviet engine specialists in 1972 to make improvements to the engines designed for the Kama trucks.

Gasoline engines are built by two of the major truck producers, the Moscow Likachev and Gor'kiy plants. The Likachev plant produces V8 engines for its own trucks (ZIL) and for trucks produced at Miass and Kutaisi, and the Gor'kiy plant builds both 6-cylinder

straight and V8 engines for its (GAZ) trucks. To improve the quality and performance of gasoline truck engines, these plants are to convert completely to V-form engines based on US design of the late 1950's. Both plants plan eventually to turn over production of engines to specialized producers. Most of the Gor'kiy engines already are being made at a subsidiary plant in Zavol'zhye, and a new plant at Arzamas has taken over the production of engines for jeeps.

Trade

The USSR supplements its inadequate production of 3-axle transport trucks, light service trucks, and other special purpose vehicles with imports, mainly from Eastern Europe. Poland, Hungary, and Czechoslovakia are the main Communist suppliers. Very few trucks are purchased in the West—63 units in 1971—mostly heavy-duty and special purpose types. Truck imports doubled between 1970 and 1971 to nearly 11,000 units, about 7 times the number imported in 1965. [See Table 9.]

The USSR presently exports about 3 times as many trucks as it imports. In 1971, about 40% of truck exports went to Eastern Europe, mostly in exchange for imports: 35% went to underdeveloped countries, primarily to the United Arab Republic and other countries in the Middle East; and about one-fifth went to Vietnam and Cuba. According to official Soviet data, 1,500 trucks were exported to Western Europe, mostly to the United Kingdom. It is not known, however, how many of these were actually sold. Many have been consigned to UMO (United Machinery Organization), an organization set up by Soviet export agencies in 1969 to lease out trucks and earth-moving equipment. The principal item exported to the UK is the KrAZ–256 15-ton dump truck which in Western markets is called BelAZ–256. The Soviets apparently believe that the well publicized BelAZ label will be more recognizable to potential buyers.

Soviet trucks are not competitive in quality with Western-made trucks and offer little potential for extensive sales. While exports may continue to increase as the Soviets establish more marketing agencies in the West, they are unlikely to represent a significant proportion either of West European truck imports or to total Soviet truck exports.

Bus Production

In 1972, the USSR produced 51,000 buses representing about 4% of the total output of motor vehicles. With the exception of a few thousand "microbuses" and intercity types, nearly all are city buses. In the current plan period, a hefty 60% increase in bus production has been planned, but in other respects the bus industry is being given scant attention. No foreign technology or machinery is being purchased, and neither buses nor bus production facilities are being modernized. Even the planned increase in bus production may be illusory. Output during 1971–72 grew by only about 8%. Moreover, the production of buses is intimately tied-in with the production of trucks at GAZ and ZIL. These plants, which formerly produced all buses, still build the chassis and engines for the bus plants. Hence, any major expansion in bus production could interfere with the higher priority production of trucks. Only one of the five bus assembly plants is being

given increased production capacity. The RAF plant in Riga, which builds microbuses, is being relocated in Yelgava and capacity will be increased from the present level of 4,000 to 15,000 buses a year.

Output at bus assembly plants in 1972 was as follows:

Plant	Type	Output
Riga (RAF)	Microbus	4,000
Pavlovo (PAZ)	City transit	22,000
Kurgan (KuAZ)	School bus	10,000
Likino (LiAZ)	City transit	6,000
L'vov (LAZ)	City transit and intercity buses	10,000

Implications of Automotive Trends for Soviet Road System

Although the number of motor vehicles in use in the USSR is still quite small by US standards, Soviet cities are already experiencing some of the unhappy side-effects of automobilization: congestion on city thoroughfares and on highways connecting major cities, air pollution, and accidents. These problems have mounted with extraordinary rapidity because of a relatively backward and underdeveloped road system. Although twice the size of the United States, the USSR has a road system about one-fourth as long—847,500 miles—excluding urban streets and roadways (see Figure 4). Moreover, only 16 percent is paved with asphalt or cement and 24 percent with gravel, making the total of hard surface roads only about 40 percent of the system. Thus, 60 percent of the system is made up of dirt roads, impassible to ordinary traffic in wet weather. Most of the paved roads are asphalt highways that link the major population centers of the European USSR. Roadways adjacent to many of the larger cities are wide and well built. The Moscow beltway, opened in 1962, was the first limited access highway to be built. The design of this 68 mile (109 kilometer) stretch of two lane divided highway is equal to US road design of about 1940. Much of the outlying area—the frozen wasteland, desert, and mountainous area—is roadless. The Far North (which includes about half the land area but only two percent of the population) has less than 5,000 miles of surfaced roads. The USSR has yet to build a highway linking Moscow with the Pacific coast, although sections of such a route do exist. In size and structure, the Soviet road network resembles the US road system of about 1920.

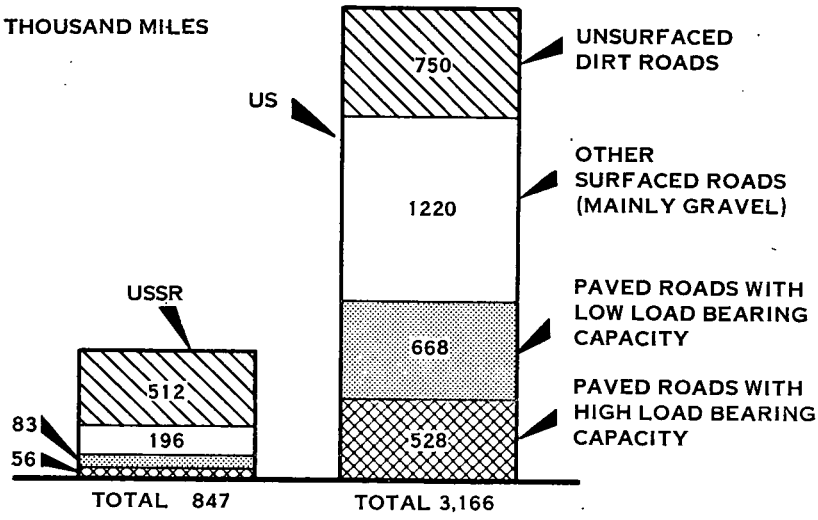
Soviet passenger cars and trucks, by and large, are limited to the use of hard surfaced roads. In bad weather, unsurfaced roads often can be travelled only by all-wheel-drive trucks and jeep type vehicles. Heavy-duty cargo trucks are further limited in use by low load-bearing roads and bridge structures; unsurfaced roads have load limits of 5–7 tons whereas on paved roads the maximum allowable weight per axle ranges from 6 to 10 tons.

Because the USSR is a planned society, it has an opportunity historically denied Western societies to plan and build roads consistent with the growth in motor vehicles and thereby facilitate the free flow of traffic and efficient movement of goods. In fact, the development of the road system is not keping pace with the accretion of motor vehicles. During 1971–75, the USSR plans to build about 68,000 miles of hard-surfaced road, less than was built during the

preceding 5-year period. Much of the new construction is designed to ease traffic congestion on two-lane highways leading into the larger cities. Elsewhere roads are being improved to accommodate increasing traffic flows.

FIGURE 4.

Road Systems of the USSR and the United States, 1971



Outlook

The USSR has made giant strides in automotive production, design, and technology since 1965, and has established a solid base for future growth and development. Prospects for meeting 1975 planned output goals of 1.26 million cars a year are good, and capacity output of about 1.35 million cars could be reached by 1976. Construction of the Kama plant for heavy transport trucks is one to two years behind schedule, but construction is now in full swing. Most importantly, detente with the United States has produced a striking new trading relationship, by virtue of which the USSR no longer is denied access to highly productive US machine tools and other automotive production equipment and technology. Ability to purchase up-to-date US equipment, which will permit Soviet plants to stay abreast of US technological advances, has fundamental long-range significance for the modernization of the Soviet automotive industry. Moreover, the growing exchange of information and visitors between the USSR and the US on both policy and working levels will facilitate the transfer of US managerial and organizational techniques to the USSR.

By 1975 the USSR will have about 4.7 million cars in use—18 cars for every 1,000 of the population, or about one car for every 54 persons. About 3 million cars will be in private hands. After 1975 the sale of cars on the domestic market is planned to increase by about 10 percent a year. Thus, by 1980, some 8 million cars out of a total inventory of 10 to 11 million could be privately owned. According to long-range forecasts by Soviet planners, 40 million cars will be in use in the USSR by the year 2000, and the family car will be common. Obviously, this goal is achievable only if personal incomes of workers are raised greatly, prices lowered, or extended-term financing is made available.

The use of private cars in the USSR for some years ahead will be greatly restricted by the scarcity of automotive service and repair facilities and by the poorly developed road system. Because the service program is poorly administered and lacks the high priority granted motor vehicle plants, construction of service stations and repair centers is far behind schedule, trained auto-mechanics are in critically short supply, and garage repair and serving equipment practically non-existent. Many car owners will have to perform service and repair work themselves, a not uncommon practice in the USSR. The road system, already inadequate for present traffic conditions, is not being improved or expanded fast enough to accommodate the flood of new cars and trucks being turned out, and motorists in and around major cities will encounter massive traffic congestion until road improvements are made.

On the world market, and particularly in Western Europe, the USSR can expect stiff competition for its exported cars. The export model Lada is well designed for sale in the West, can be priced below the Fiat cars built in Italy, and can be serviced by existing Fiat dealerships. However, quality and durability *vis a vis* Western models will have to be proven. Soviet plants may not be able to meet the consistently high standards of Western producers for quality and workmanship, and defects in finished cars that result from inferior materials or poor quality control probably will not be acceptable to buyers in most Western markets.

Despite notable improvements in the truck industry, short-run prospects are that the USSR can meet no more than its most urgent needs for trucks. During 1971–75 the traditional truck mix is not being sifinificantly altered and a wide range of trucks, especially small service and heavy cargo types, will continue to be in critically short supply. The Ul'yanovsk plant, major center for the production of light vehicles, is having difficulty completing its construction program, and producers of heavy trucks (Minsk, Kremenchug, and Miass), already operating at or near capacity, are not being enlarged.

For the longer run, 1976–80, prospects are somewhat better. Completion of the new construction at the Ul'yanovsk facility will increase output of light trucks to 150,000 units a year, two and one-half times the number planned for 1975. In addition, the Kama complex during 1976–77 should be building heavy diesel trucks at a date of 115,000 per year and during 1977–1980 at the rate of 150,000 per year.

TABLE 9.—SOVIET IMPORTS OF MOTOR VEHICLES FROM EASTERN EUROPE AND NON-COMMUNIST COUNTRIES[1]

[Units]

Motor vehicle and year	Total	Eastern Europe	Non-Communist countres
Cars:			
1965	1,490	1,463	27
1968	10	10	0
1970	0	0	0
1971	0	0	0
Trucks:			
1965	1,619	1,614	5
1968	2,791	2,762	29
1970	4,658	4,571	87
1971	10,894	10,831	63
Buses:			
1965	602	600	2
1968	2,881	2,825	56
1970	4,937	4,934	3
1971	6,039	6,038	1

[1] Official Soviet trade handbook, "Vneshnaya torgovlye S.S.S.R.," for all years.

TABLE 10.—SOVIET RETAIL SALES OF PASSENGER CARS AS A SHARE OF OUTPUT IN RECENT YEARS AND PLANS THROUGH 1975

[In thousands]

Year	Output	Retail sales	Retail sales as a percentage of output
1965	[1] 201	[1] 64	32
1970	[1] 344	[1] 123	36
1971	[1] 529	[1] 222	42
1972	[2] 730	[2] 377	52
1973 plan	[3] 997	[4] 550	58
1974 plan	[3] 1,204	[4] 700	56
1975 plan	[3] 1,260	[5] 750	60
1971–75 total	4,700	2,600	55

[1] Narodnoye khozyaystvo SSSR, 1922–72, pp. 186 and 400.
[2] Izvestiya, Jan. 30, 1973.
[3] Gosudarstvennyy pyatiletniy plan razvitiya narodnovo khozyaistvo SSSR na 1971–75 gody, p. 347.
[4] Estimated.
[5] Sovetskaya Latviva, Jan. 30, 1972.

Part IV. AGRICULTURE

RECENT DEVELOPMENTS IN OUTPUT AND PRODUCTIVITY IN SOVIET AGRICULTURE

By DOUGLAS B. DIAMOND *and* CONSTANCE B. KRUEGER

CONTENTS

I. INTRODUCTION

Since assuming power in 1965, the Brezhnev regime has committed itself increasingly to a policy of raising consumer welfare, especially through improvements in the Soviet diet. The extent to which these commitments could be met has depended, until recently, on the regime's ability to stimulate farm production. While considerable progress was made in increasing farm output during 1966–70, agricultural production has stagnated since 1970. The lack of progress in Soviet agriculture in 1971, followed by a decline in 1972, has brought agricultural production back to about the level of 1968.

A major part of the decline since 1970 can be attributed to less favorable growing conditions; the very favorable weather conditions of 1968 and 1970 have been replaced by normal (1971) or worse-than-normal conditions (1972). Other important reasons include the failure of the farm sector to improve its productivity performance in the use of resources.

Even before the production shortfall of 1972, however, it had become apparent that the rate of progress achieved by the farm sector was not keeping up with the demands stemming from new consumer programs. Although agricultural production in 1971 remained at the record level achieved in 1970, the USSR imported a record-high volume of farm products in fiscal year 1972 in an effort to maintain the forward momentum in improving the quality of the Soviet diet. The regime apparently is no longer willing to permit food consumption

to follow the whims of Soviet weather but rather requires a steady increase in the availability of meat and other quality foods.

This paper reviews the production achieved by the Soviet farm sector and the resources provided under successive programs of the Brezhnev regime. Section II discusses trends in output and productivity in the 1960s.[1] In section III the implementation of the latest Brezhnev Program for 1971–75 is evaluated. Finally, in section IV the production record in 1971–72 is discussed, and the recent record of Soviet imports of grain and other food products is reviewed.

TABLE 1.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF NET AGRICULTURAL OUTPUT, SELECTED PERIODS, 1951–72 AND PLAN 1971–75[1]

[In percent]

	Straight annual	3-year moving average[2]
1951–71	3.9	3.8
1951–60	4.4	4.9
1960–64	2.3	1.2
1961–65	2.8	2.8
1966–68	4.7	3.0
1966–70	4.7	3.4
1971	.1	1.5
1972	−7.8	[3] −5.3
1971–75 plan	3.6	[3] 4.5

[1] The base year for the calculations shown in each line is the year before the stated initial year of period; that is, the average annual rate of increase for 1951–60 is computed by relating production in 1960 to base year 1950.

[2] Average annual rates of growth were computed by relating the 3-year average for the terminal year (for example, output in 1960 as the average for 1959, 1960, and 1961) to a similar 3-year average for the base year (1950).

[3] Output for the terminal year only over the 3-year average for the base year.

II. Trends in Output and Productivity, 1961–70

Soviet farm output grew more rapidly in the last half of the 1960s compared to the first half of the decade (see Table 1) despite a decline in the rate of increase of resources committed to the agricultural sector. Aggregate inputs in 1970 were 6½ percent above 1965 (see Table 2), one-third of the rise slated under the Brezhnev Program for 1966–70[2] and even below the 9 percent growth posted for the period 1960–64.

More significant for the present leadership—output grew substantially faster than inputs during 1966–70, thus reversing the declining trend in the growth of productivity[3] registered during 1960–64. In part, the gain in productivity of 2 percent annually in 1966–70, compared with −½ percent in 1960–64, was attributable to more favorable weather at the end of the 1960s. The terminal year 1964 in the Khrushchevian era includes the impact of the disastrous years 1963 and 1965 for which there are no counterparts at the end of the decade.

[1] In an earlier paper for the Joint Economic Committee one of the authors reported on trends in farm output and productivity for the period 1950–64. These series are revised and extended in this article. See Douglas B. Diamond "Trends in Output, Inputs, and Factor Productivity in Soviet Agriculture", U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II–B, U.S. Government Printing Office 1966, Washington, D.C., p. 339–81.

[2] The program for improving the state of Soviet agriculture—popularly termed the Brezhnev Program—following the political demise of Khrushchev in October 1964 was first announced at a Plenum of the CPSU in March 1965. The plan for additions to total inputs entailed a boost of 18½ percent over the five years 1966–70, or 3½ percent per year.

[3] That is, growth of output not explained by inputs. These are comparative rates when output is centered on a 3-year average. However, use of actual output in the base and terminal years in the two 5-year comparisons would not change the overall finding.

TABLE 2.—U.S.S.R.: INDEXES OF OUTPUT, INPUTS, AND FACTOR PRODUCTIVITY IN AGRICULTURE, 1950, 1955, 1960–72, AND 1975 PLAN
[1965=100]

	1950	1955	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Plan 1975
Output (3-year moving average)[1]	54	69	87	89	87	88	90	100	104	109	109	115	118	120	[2] 114	[3] 147
Total inputs[3]	68	79	87	89	92	93	95	100	102	102	103	104	107	108	111	117
Land	75	91	97	98	103	104	102	100	99	99	99	99	98	99	99	98
Livestock	61	67	91	93	99	103	102	100	101	103	103	103	102	102	103	110
Fixed capital	27	41	64	70	76	84	92	100	108	117	127	137	150	164	181	251
Current purchases	29	44	64	70	77	80	88	100	108	116	123	128	135	143	152	186
Labor	104	105	98	98	98	95	95	100	100	96	95	93	94	94	94	90
Factor productivity[4]	80	87	100	100	94	94	95	100	102	106	106	110	111	111	102	125

AVERAGE ANNUAL RATE OF GROWTH (PERCENT)

	1951–55	1956–60	1961–65	1966–70	1971–72	1971–75 Plan
Output (3-year moving average)	4.8	4.9	2.8	3.4	[2] −1.9	[3] 4.5
Total inputs	3.1	2.0	2.8	1.3	2.0	1.9
Factor productivity	1.7	2.9	−.04	2.1	−3.8	2.5

[1] Computed from data of appendix table D–1.
[2] Output for the terminal year only over the 3-year average for the base year.
[3] This index gives a measure of the level of output expected to be obtained from the indicated levels of conventional inputs listed in this table—land, livestock, fixed capital, current purchases (fertilizers, fuel, and other), and labor (expressed in man-days worked).
[4] The ratio of the (unrounded) index of output to the (unrounded) index of total inputs.

Whatever the underlying causes of the relatively rapid productivity gain in 1966–70, the striking success in increasing farm output by nearly one-fifth was achieved with the use of a level of resources far short of the original intention for the five year period. The evidence would suggest that most of the shortfall in implementing the first Brezhnev Program came in the period 1967–69. The three years 1966–68 were favorable and output averaged nearly one-fourth above the last three years of Khrushchev's regime, 1962–64, permitting moderate improvement in the quality of the consumer's diet, the replenishment of grain reserves, and the elimination of large net imports of farm products. Apparently as a result of these successes, there were major cutbacks in original plans for 1967–69 to allocate large additional resources to farms, particularly those that depended primarily on industrially produced goods. The decline in farm output in 1969, taken together with evidence of a marked increase in the population's dissatisfaction with the slow pace of improvements in the diet, apparently persuaded the leadership that a step-up in resource flows to agriculture was required in 1970 and beyond.[4] In 1970, the last year of the first Brezhnev program, inputs increased by nearly 2½ percent, or as much as the total aggregate increase had been for the period 1967–69. This increase in the resource base in 1970, coupled with generally favorable weather conditions for crops, boosted net farm output to a record level.

III. Plan 1971–75: Brezhnev Program II and Its Implementation

In addition to the decision to step-up markedly the flow of inputs in 1970, further evidence of the regime's concern over the lag in farm output came even before the results of the 1970 harvest were known. The second five-year program for improving the state of Soviet agriculture was first spelled out at a Plenum of the CPSU in July 1970, nearly a year before the balance of the overall economic plan was considered at the Twenty-Fourth Party Congress and at another Plenum in the spring of 1971. Again, as in the launching of the 1966–70 plan for agriculture, Secretary General Brezhnev acted as spokesman for the regime's second major program.[5]

At first glance, the farm output targets for 1971–75 appear only moderately ambitious. Net agricultural output would have to increase by about 3½ percent per year above the 1970 level to achieve the official goal for the new plan period. However, when the impact of favorable weather on production in the base year 1970 is dampened by averaging output for three years (1969–71) the required average annual rate of growth would have to rise to 4½ percent.

The estimated plan for additions to total inputs to farms entails a boost of 10 percent between 1970 and 1975, with marked emphasis on industrially produced inputs. As a result, capacity in selected branches of industry is to be expanded to provide the flow of producer durables, construction materials, agricultural chemicals, and other producer

[4] This increased dissatisfaction was focused in large part on meeting consumer demand for meat. Following impressive increases in per capita availabilities of meat in 1965–67, consumption levelled off in 1968 and 1969. Moreover, the continued rise in personal money incomes added to the already existing and substantial unsatisfied demand for meat.

[5] Because of his continuing close association with plans for agriculture, the 1971–75 plan will be referred to as Brezhnev Program II.

goods necessary to support the higher levels of direct investment in agriculture.

The highlights of the new plan are as follows:

Investment directly into agriculture is scheduled to be nearly 129 billion rubles (about $172 billion) during 1971–75.[6] Meeting this goal will require agricultural investments to grow an average of 9½ percent a year and to rise as a share of all investments from 23½ percent in 1970 to 27½ percent in 1975.

Total investment in machinery and equipment (producer durables) for farms during 1971–75 is planned to be 35½ billion rubles, a 54 percent increase over the value of such deliveries to farms in the last half of the 1960s.

About one-fifth of total investment in agriculture is to be expended on land amelioration, mostly reclamation by irrigation and drainage. The boost in investment in land reclamation is to result in an expansion of about 30 percent in the stock of irrigated and drained land. In support of the reclamation effort, Soviet industry is to deliver new construction equipment into agriculture in an amount equal to nearly 90 percent of the total inventory of such equipment in the overall construction sector at the end of 1970.

In addition to a step-up in the flow of investment goods to agriculture, the flows of other types of industrially produced goods to farms are to be expanded. Overall deliveries of major types of producer goods used in current productive activity in agriculture are to rise at an average annual rate of 6½ percent during 1971–75.[7] Especially noteworthy are a scheduled rise of two-thirds in the use of fertilizer and a significant growth in use of plant protection materials (pesticides and herbicides). The required increase in production of these goods will necessitate further large investments in the chemical industry.

All of the 19½ percent increase in output for the period 1971–75 is to come from the country's collective and state farms. Production from individual holdings which contributed 30 percent of total output in 1970 is implicitly slated to decline slowly in the 1971–75 period. As a result, if the initial plans for output in the private sector are carried out, the above measures for achieving a rapid advance in output in the socialized sector may be partially offset.

Implementation of the New Plan in 1971–72

Although some parts are slightly behind schedule, important steps were taken in 1971 and 1972 to implement the 1971–75 plan for agriculture. Overall, total inputs increased at an average annual rate of 2 percent, slightly above the growth required to meet the 1975 goal. Hence, despite the surge in output in 1970—up 13½ percent over 1969—followed by a repeat of the record level of output in 1971, the regime apparently remained firm in its resolve to sustain the resource commitments embraced in Brezhnev Program II.

Investment

Investment growth in 1971–72 averaged 11 percent—slightly above target and considerably above the rate achieved in 1966–70 (see Table 3). As a result, the growth of the stock of fixed assets (buildings, machinery, and equipment) rose to the rate called for in the 1971–75 plan, and substantially above the preceding five years. The marked slowdown in growth of investment—especially the construction component—in 1972 compared to 1971 is thought to reflect the disrupting

[6] The nominal value of the ruble is 0.75 rubles to US $1. Conversion at this value gives a rough idea of the magnitude of economic quantities involved in the second Brezhnev program for Soviet agriculture.

[7] The major types of producer goods included here are fertilizer, electric power, fuels and lubricants, current repair services, rubber products, industrially produced feeds, and lime.

influence of the farm situation in 1972 rather than a shift in priority away from agriculture.[8]

TABLE 3.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF SELECTED INPUTS IN AGRICULTURE, 1966–75

[In percent]

	1966–70	1970	1971	1972	1971–75 Plan
Fixed assets [1]	8½	10	9½	11	11
Current purchases [2]	6	5	6	6	6½
Annual investment [3]	7½	12½	14½	[4] 7	10
Construction	8½	14½	15	[4] 6½	10½
Machinery and equipment	6½	9	14½	[4] 8	9

[1] Change in the gross value of reproducible physical assets (buildings, structures, and machinery and equipment) and draft animals.
[2] Change in purchase of materials from outside agriculture for use in current production activities—fertilizer, electric power, fuels and lubricants, current repair services, rubber products, industrially processed feeds, and lime.
[3] Productive investment only. Average annual rates of growth for 1966–70 and 1971–75 Plan are constant growth rates calculated to exhaust cumulative investment for the two 5-year periods when projected from the base years 1965 and 1970, respectively.
[4] Preliminary.

Farm Machinery

Although deliveries of tractors and combines are somewhat behind schedule, shipments to farms of trucks and other types of agricultural machinery are at or above the original targets (see Table 4). The spurt in deliveries of trucks to farms in 1972—up 44 thousand over 1971—may, in part, reflect the special measures taken last year to cope with the bumper crop in the East and the drought-stricken areas in European Russia.[9]

Despite the impressive record in 1971–72 in sustaining high levels of deliveries of principal types of machinery to farms, the net growth in inventories has been declining. In 1971, parks of major types of machinery increased at a rate of 3 percent compared to an average annual rate of 4 percent in 1966–70 and 5 percent in 1961–65. If this tempo continues, the increase in total inventories of machinery in 1971–75 will be about 80 percent of that planned. The problem lies in the deficiencies in machine quality and durability which, taken together with poor maintenance and high rates of usage, result in very high retirement rates. For example, the discard rate for tractors in 1970 and 1971 averaged 12½ percent, more than three times the rate of retirement from U.S. parks. Moreover, the recent Soviet rates of retirement for tractors and trucks are above the high levels of the 1960s. The Soviet press continues to be rife with complaints about the abysmal quality and unsuitability of machinery delivered to agriculture, about

[8] See Section IV below. The above-normal manpower and transportation requirements of the 1972 planting and harvest periods probably held down investment activity in rural areas. More construction workers than usual were detailed to support farm work, and the supply of construction materials and delivery of producer durables must have been interrupted by the round-up of trucks for agricultural work. The unusual demands leading to a major diversion of resources included a record-high spring sowing (due to a severe winter-kill of fall sown crops) and an all-out effort to garner the record-high grain crop in the New Lands of Siberia and Kazakhstan, following the officially expressed anxiety over a harvest failure in European Russia.

[9] The share of total truck production delivered to farms rose from 25 percent in 1971 to 31 percent in 1972. In addition to the logistical problem of moving a record crop in the area east of the Urals before the onset of winter, the Soviets were required to carry out a massive transport effort in a 33 oblast area of European Russia affected by drought. The farms in the area, which includes more than one-third of the livestock in the country, either required supplemental livestock feed supplies from other parts of the country to sustain herds or temporary transfer of livestock to areas outside of the drought zone.

the shortage of spare parts, and about the lack of satisfactory facilities for repair and maintenance.

TABLE 4.—U.S.S.R.: INDICATORS OF INVESTMENT IN MACHINERY AND EQUIPMENT IN AGRICULTURE, 1966–75

	Actual			Plan
	1966–70 average [1]	1971	1972	1971–75 average [1]
Total investment in machinery and equipment:				
Billion rubles [2]	4.6	6.3	[3] 6.8	7.1
Percent increase	6.5	14.6	[3] 7.9	8.8
Tractors: [4]				
Thousand units	293.5	313.2	312.0	340.0
Percent increase	6.9	1.3	−.4	3.2
Trucks: [4]				
Thousand units	143.5	143.5	187.0	220.0
Percent increase	14.3	−8.4	30.3	11.6
Agricultural machinery: [4]				
Million rubles [5]	1,820	2,460	2,740	3,100
Percent increase	7.0	16.4	11.4	13.0
Of which:				
Grain combines: [4]				
Thousand units	93.8	99.0	93.0	108.6
Percent increase	5.6	2.0	−6.1	3.8

[1] Percents are expressed as average annual rates of change. Growth rates have been calculated as described in table 3, footnote 3.
[2] In investment prices (so-called "estimate cost") of 1 January 1969.
[3] Preliminary.
[4] Deliveries to agriculture.
[5] Prices of 1 July 1967.

Land Reclamation

In the USSR irrigation has long been an important means of increasing production of crops, particularly high-value crops such as cotton, fruits, and vegetables. Drainage,[10] a less expensive method of reclamation, has had considerably less emphasis during the course of the five-year plans. But both irrigation and drainage are now being brought to the fore because of lack of alternative opportunities for a major expansion of cropland.

During 1971-75, more than 6½ million additional hectares are scheduled to be added to the stock of irrigated and drained land, compared with a slight decline of a half million hectares in 1966–70.[11] This is only about 3 percent of the total cultivated acreage (sown and fallowed) in 1970. But because of higher productivity per hectare, especially on the irrigated land, such an addition of reclaimed land would add the equivalent of about 10½ million hectares to the present stock of tilled acreage.

While the step-up in annual gross additions of drained land in 1971–72 lagged somewhat behind the level required to meet the five-year plan goals, the cumulative increases for drained and irrigated land taken together were impressive—nearly two-fifths of the overall target for 1971–75. However, accomplishment of the 1975 acreage targets for properly drained and irrigated land will not be easy. The USSR has had a poor record in maintaining drainage and irrigation systems in operating conditions. For example, in the past the covered and tiled drainage systems, which are scheduled to expand rapidly and to

[10] The removal by artificial means of excess water from the soil to enhance crop production.
[11] Net additions. See Table 5 for gross additions.

TABLE 5.—U.S.S.R.: ANNUAL GROSS ADDITIONS TO THE STOCK OF IRRIGATED AND DRAINED LAND, 1966–75

	Actual			Plan
	1966–70 average[1]	1971	1972	1971–75 average[1]
Irrigated land:				
Thousand hectares	360	500	800	[2] 640
Percent increase	−3.0	29.5	60.0	[2] 21
Drained land:				
Thousand hectares	782	800	900	[2] 1,000
Percent increase	3.3	−1.8	12.5	[2] 7.5

[1] Percents are expressed as average annual rates of change. Growth rates have been calculated as described in table 3 footnote 3. For the 1971–75 Plan entries are related to comparable data (i.e., state-financed) for the base year.

[2] State-financed work only; collective farm-financed work is excluded. In the 1966–70 period the latter annually accounted for an average of 67,000 hectares of gross additions of irrigated land and 18,000 hectares of drained land. These were equivalent to 18½ and 2½ percent, respectively, of total gross additions from all sources of finance.

account for more than half of total drained acreage in 1975, have been built with inferior tile that collapsed under the weight of heavy Soviet farm machinery. In irrigated areas about two-fifths of the land is subject to salinization to some degree. Annual washings carried out in rotation to lower the salinity remain partially ineffective because of disrepaired and uncleaned collection and drainage networks.

As a result of these and other problems, the rate of retirement of reclaimed land from production has been high enough in the past to nullify the sizable annual gross additions. During 1966–70, for example, 5½ million hectares of newly reclaimed land were not enough to offset the discarding of 6 million hectares because of low productivity. In order to meet the target for the net additions to stock of reclaimed land by 1975 the rate of retirement for irrigated land will have to be reduced by more than one-half and for drained land by three-fourths.

Under Brezhnev Program II, irrigated and drained land is to provide nearly one-third of the 32 million ton increase in grain output between the annual average output for 1966–70 and that planned for 1975. The use of irrigated land for growing grain is relatively inefficient under Soviet conditions—under the assumption of normal weather conditions. Given the risk of future sharp fluctuations in nonirrigated grain yields, the regime apparently feels that high-cost grain from irrigated acreage is preferrable to relying on emergency imports.

Agricultural Chemicals

The availabilities of agricultural chemicals will be decisive factors both in the expansion of farm output and in achievement of improved stability. The new plan calls for a large expansion in the use of these chemicals—fertilizer and lime as soil additives, herbicides and pesticides as plant protection materials. Indeed Soviet planners expect that nearly two-fifths of the gain in total gross farm output in 1971–75 will be attributable to the increased use of fertilizer alone.

Annual deliveries of fertilizer are to reach 75 million tons by 1975, nearly two-thirds above the 1970 level. Of this amount, about 32 million tons of fertilizer are scheduled to be applied to grain in 1975, thereby raising the share of fertilizer allocated to grain crops from 36 percent in 1970 to 43 percent in 1975. Even if deliveries of fertilizer to agriculture fall short of the planned 75 million tons, the priority of

grain crops may be maintained because of the anxiety of the regime over the grain supply.[12]

TABLE 6.—U.S.S.R.: USE OF SOIL ADDITIVES, 1966–75

	Actual			Plan
	1966–70 average[1]	1971	1972	1971–75 average[1]
Mineral fertilizer, deliveries to agriculture:				
Million tons, standard units	37.0	50.6	54.9	60.6
Percent increase[2]	10.6	10.8	8.5	9.6
Area limed:				
Million hectares	4.5	5.2	5.5	5.9
Percent increase[2]	15.1	3.3	6.4	5.5

[1] Percents are expressed as average annual rates of change. Growth rates have been calculated as described in table 3, footnote 3.
[2] Computed from unrounded data.

Periodic application of lime to neutralize acid soils is essential for efficient use of mineral fertilizers. The new plan calls for the liming of nearly 30 million hectares—an area equal to 14 percent of total Soviet sown acreage in 1970. This is significantly more than the 22½ million hectares treated in the last half of the 1960s which was a major factor in rapidly raising grain yields in the "non-black soil zone" of European Russia. Indeed, a large part of the country's additional grain output in the latter years of the 1966–70 period in comparison to the first half of the decade was attributable to expanded use of fertilizer and lime in this area, where, because of the usually adequate moisture in the region, application of fertilizer on well-limed soil provides high and stable yields. In this area production of grain in 1969 and 1970 averaged 25½ million tons, or more than 80 percent above the annual average level of output attained in 1961–65. As a result, this area, which accounted for only 13 percent of the country's total production in 1961–65, provided more than one-third of the country's total increase in grain production between the two time periods (that is, the annual average production in 1961–65 and 1969–70).

The soil additive programs for 1971–72 are generally on schedule (see Table 6). Nearly ten million tons (or one-fifth) more fertilizer were delivered to farms in 1972 than in 1970, and an additional 10 million hectares of acid soil received a periodic application of lime.

On the other hand, the record in the first two years in providing farms with additional amounts of plant protection materials has not been impressive. While production of these materials in 1972 was 3 percent above 1970, net imports—a major source of supply for the farms—fell in both 1970 and 1971.

Although the 1973 plan for fertilizer calls for only a modest boost of 7½ percent in production, recent and planned developments in adding new production capacity are a harbinger of high rates of growth in 1974 and 1975. Gross additions to new production capacity more than

[12] There are indications that a similar anxiety over the lagging production of sugar beets in 1971–72 will lead to a temporary shift of fertilizer from cotton to sugar beets in 1973. Sugar beet production in the past two years has averaged 9½ percent below the average for 1966–70. The shortfall in domestic output, coupled with a decline in available supplies from the Cuban crop, has led to Soviet hard currency outlays of nearly $300 million in 1971–72 for imports from third countries.

doubled in 1972—up to 7 million tons compared to 3 million tons in 1971—and are scheduled to rise to 9½ million tons in 1973. In order to offset failures in the first two years, investment in 1973 in the fertilizer industry is to rise by a whopping 80 percent.

Policy Toward Private Agricultural Activity

Private agriculture in the USSR today is almost exclusively composed of individual holdings—"victory garden" size up to 0.5 hectares—frequently combined with the ownership of one or two head of livestock and a small flock of poultry. Although the share of total farm output produced in the private sector has declined during the decade, the sector has provided nearly one-third of production in recent years. The private sector has specialized in potatoes, of which it contributes about 65 percent of total output; other vegetables, 40 percent of total output; meat and milk, 35 percent of total output; and eggs, 50 percent of total output. Although long-run official policy toward private activity can be characterized as one of repression, in the past, campaigns to suppress private activity have alternated with periods of relaxation. An important element in the stagnation of overall agricultural growth in the latter years of the Khrushchev era was a small decline in output from the private sector between 1958 and 1964, reflecting a policy of official discouragement. Since 1964, policy under the Brezhnev regime has fluctuated between encouragement, indifference, and outright antagonism. Overall, however, policy during 1965–70 was tolerant enough to bring about a 10 percent increase in output originating from individual holdings, an important contributing factor to total farm output.

The original 1971–75 output goals imply a less lenient policy for the five-year period. By 1975, output from the private sector is to be nearly a tenth below 1970. Under such circumstances all of the burden for realizing the planned increase in overall net agricultural output will fall on the socialized sector; output from collective and state farms would have to increase at an average annual rate of about 6 percent in contrast with the 3½ percent rate targeted for overall (socialized plus private) net production.

In 1971, output from individual holdings remained unchanged from 1970. While official figures have not yet been released for 1972, the effects of the drought impinged more on the private than the socialized sector.[13] As a result, output in the private sector may have declined by as much as 10 percent. However, since official policy toward private activity is tactically flexible when necessary, the sharp setback in output in 1972 in both the private and socialized sectors may be followed by an active policy of encouragement to the private sector in 1973 and 1974.

[13] In the drought affected area of European Russia, individual holdings play a relatively more important role in total output than for the country as a whole. This distribution effect, taken together with a probable official policy of favoring the socialized sector in allocating the extremely limited feed supplies, led to a relatively larger reduction in private herds. Compared to a slight increase in livestock inventories in the socialized sector, individual livestock holdings decreased about 4 percent between the beginning and the end of 1972.

IV. Output Performance in 1971–72

A repeat in 1971 of the all-time high level of net agricultural output of 1970 was followed by a drop of nearly 8 percent in 1972 (see Table 7). Although a rise in the output of animal products in 1971 offset a 1½ decline in the production of crops, the small increase in livestock production in 1972 was swamped by a sharp decline of 10 percent in crops.[14] The decrease in the production of crops in 1972 was due in large part to the smaller harvests of grain and potatoes. Although the "worst drought in 100 years" in European USSR—according to Soviet officials—was largely to blame, there was an unusual streak of poor weather throughout the growing and harvesting season.[15]

TABLE 7.—U.S.S.R.: PRODUCTION OF MAJOR CROPS AND ANIMAL PRODUCTS, 1967–72

	1967	1968	1969	1970	1971	1972
	Annual rate of growth (percent)					
Total value of farm output [1]	−0.6	5.6	−3.8	13.6	0.1	−7.8
Crops [2]	.7	7.6	−8.9	14.3	−1.3	−10.2
Animal products [3]	6.5	2.1	.3	4.1	5.8	.9
	Million metric tons					
Physical production of major farm commodities:						
Grain	122.0	134.6	128.0	149.9	148.3	134.0
Potatoes	95.5	102.2	91.8	96.8	92.7	77.7
Sugar beets	87.1	94.3	71.2	78.3	72.2	74.6
Cotton	6.0	5.9	5.7	6.9	7.1	7.3
Vegetables	20.5	19.0	18.7	21.2	20.8	19.1
Meat	11.5	11.6	11.8	12.3	13.3	13.6
Milk	79.9	82.3	81.5	83.0	83.2	83.2
	Billion					
Eggs	33.9	35.7	37.2	40.7	45.1	48.2

[1] Agricultural output for sale and home consumption net of uses of farm products as seed and livestock feed. Price weights for 1968 have been used in aggregating the physical output of crops and animal products (including changes in inventories of livestock).
[2] Value of food and technical crops less seed but including the portion fed to livestock.
[3] Excludes value of changes in livestock inventories.

The shortfalls in the grain and potato crops were damaging because bread grains—wheat and rye—and potatoes are the principal part of the Soviet diet, and feed grains, as well as a large share of the bread grains and potatoes, are essential to the production of meat, milk, and eggs. The 1972 harvest of usable grain is estimated to be about 134 million tons, far less than the 148 million and 150 million gathered in 1971 and 1970, respectively. The 1972 potato crop was down about 15 percent from the below-average 1971 level.

In addition to the impact on grain and potatoes the drought also damaged sugar beets and sunflower seeds, the country's primary source of vegetable oil. In fact, the output of all important crops except cotton fell below the levels achieved in 1966–70.

[14] Livestock products excluding changes in herd inventories. Total farm output includes changes in livestock inventories.
[15] First, a lack of snow cover combined with extreme cold in late January and February killed almost one-third of the area sown to winter grains. These grains usually provide almost one-third of total Soviet grain output. The USSR planted a larger than normal area to spring grains to make up for the winterkill, but the drought curbed their germination and growth in European Russia. The drought also sharply reduced potato output. Record grain crops in the "New Lands" of Kazakhstan and Siberia prevented a complete disaster, but the harvest was late. As a consequence, a good deal of the grain was gathered in rain and snow, reducing its quality.

The output of livestock products failed to match the vigorous growth achieved in 1971, largely because of tight feed supplies. There was little slaughtering of livestock, however, such as occurred on a massive scale after the poor harvest of 1963 because of feed shortages. By the end of 1972 the number of cattle exceeded the previous year's level, while the decline in hogs, sheep, and goats was held to reasonable proportions.

The regime's response to the leveling of output in 1971 and sharp decline in 1972 was to authorize a major step-up in imports of farm products. Even before the massive and well publicized purchases of grain following the harvest shortfall in 1972, the USSR had turned to the international market to fill the deficit in domestic supplies of grain and other products.

Although during most of the last two decades the USSR has been a net importer of agricultural products, the estimated value of net imports in fiscal year 1972 was $740 million or 2½ times the level for fiscal year 1969. Most of the gain was attributable to hard currency outlays for grain, sugar, and meat. The USSR spent roughly $700 million in hard currency to purchase large quantities of these commodities in 1971 and early 1972.[16]

While the extent of the increase in 1973 over 1972 must await returns, it is clear that another large boost in net imports will again be posted. Even before the full extent of the damage to last year's grain crop became apparent, the USSR bought $250 million worth of wheat from Canada for delivery in fiscal year 1973 and promised to buy at least $750 million of US grain over a three-year period (and at least $200 million in the first year).

When the dimensions of the poor harvest became clear in the summer of 1972, the USSR bought 22 million tons of grain on the international market in July and August. Further purchases were made between September 1972 and May 1973. As of May 1973, their purchases of grain for delivery between 1 July 1972 and 1 November 1973 reached about 31 million tons, worth more than $2 billion in hard currency. This amount is equivalent to roughly two-thirds of total Soviet imports from the Developed West in 1971 and equals about one-fifth of the Soviet grain crop in 1971.

TABLE 8.—U.S.S.R.: EXPORTS AND IMPORTS OF GRAIN [1]

[In thousands of metric tons]

Fiscal year [2]	Exports	Imports [3]	Net exports
1964	5, 330	10, 351	−5, 021
1965	4, 322	2, 960	1, 362
1966	4, 362	9, 526	−5, 164
1967	5, 389	5, 679	−290
1968	6, 466	2, 593	3, 873
1969	7, 133	1, 827	5, 306
1970	7, 421	2, 092	5, 329
1971	8, 260	3, 224	5, 036
1972	8, 000	7, 790	210
1973	[4] 6, 000	[4] 27, 600	[4] −21, 600

[1] Including flour (converted into equivalent grain by using a 72-percent extraction rate) and groats.
[2] Data are an average of 2 calendar years, except for imports in fiscal years 1964–66 and fiscal years 1972–73. Data are for fiscal years ending June 30 of the stated year.
[3] Including purchases on Soviet account for shipment to East European countries and other client states.
[4] Preliminary.

[16] In fiscal year 1972 following the second consecutive bumper grain harvest, the Soviets purchased 8 million tons of grain worth nearly one-half billion dollars.

The regime's bad luck in having to rely more heavily than usual on foreign supplies of food in the past two years is undoubtedly not to its liking. Many in the leadership have probably argued that the long-term trends in output and resource productivity have been obscured by unfavorable weather and that normal weather will bring recovery followed by further growth. Indeed, recent official statements on resource policy, coupled with published plan data for 1973, do not suggest an effort to enhance greatly the resource flows to farms originally scheduled in the 1971–75 plan. On the other hand, even as the general economic slump in 1971 and 1972 forced cutbacks in resource plans for industry and the other non-farm sectors, allocations to agriculture were maintained at or moderately above those originally scheduled. This would suggest that, unlike in the past, when a broad range of goals cannot be met simultaneously, the planned allocations to agriculture will be given priority.

Appendix A

Formula and Selection of Weights for Index of Inputs

A. Choice of Index Formula

The several inputs considered are aggregated into a geometric function of the Cobb-Douglas type as presented in Diamond, *op. cit.*, p. 376. Each input is weighted with its relative share or contribution to total output in the base period (1966). The concept of output considered is value added by agriculture plus purchases from non-agriculture of materials for current use.

B. Estimation of Value of Output for Sale and Home Consumption in 1966

Total value of production for sale and home consumption is estimated to have amounted to 57,437 million rubles in 1966 in current prices.

The estimate is made up of the following components:

	(*Million rubles*)
1. Sales to nonagricultural sectors as intermediate products	37,198
2. Net sales to consumers as final products	4,299
3. Consumption of farm products as income-in-kind	15,600
4. Net foreign sales	340
Total	57,437

Line 1: Comprised of receipts of the agricultural sector from sales to other producing sectors, primarily the food and textile industry. The entry is derived from the 1966 Soviet Input-Output table as presented by Vladimir G. Treml, Dimitri M. Gallik, Barry L. Kostinsky, and Kurt W. Kruger in *The Structure of the Soviet Economy—Analysis and Reconstruction of the 1966 Input-Output Table*, Praeger Publishers, 1972, p. 465, 469.

Line 2: Sum of direct sales by agriculture to the population of 1,000 million rubles through "commission" stores [1,176 million rubles gross sales from TsSU, *Narodnoye khozyaystvo SSSR v 1967 godu*, Moscow, 1968, p. 724 (hereafter referred to as *Narkhoz 1967* and similarly for other years in the series of official Soviet statistical handbooks) minus an allowance of 15 percent for trade margin] plus 3,299 million rubles of net sales through the collective farm market (3,666 million rubles gross sales from *Narkhoz 1967*, p. 762) minus an allowance of 10 percent for trade margin.

Line 3: Unpublished estimate by authors. Prices used are the average realized prices received by producers.

Line 4: Value of exports of agricultural products (expressed in domestic prices) is from Treml, *et al.*, *op. cit.*, p. 163.

C. Estimation of Coefficients

GENERAL CONSIDERATIONS

The five series of inputs are combined by use of 1966 weights that represent the monetary value of imputed costs attributed to each of the inputs. Data are

available on actual expenditures for labor and for current purchases from other sectors of the economy, but not for the other inputs. This is because there is no explicit accounting in the USSR for returns to land, fixed capital, and productive livestock. In order to obtain an "expenditures" weight for the latter two, rather arbitrary assumptions were adopted. First, the income share or service flow for these two factors was derived by assuming an interest rate of 12 percent, and depreciation allowances for capital (excluding draft animals) were then added in order to obtain a gross return on total capital stock. An interest rate on capital investment of 12 percent is currently used officially to impute charges on capital to aid Soviet planners in deciding among alternative investments within a given sector of the economy.

In a previous report to this committee (Diamond, *op. cit.*) the return to land in 1959 (the base year in the production function) was taken as the difference between the value of agricultural output and the expenditure or service flows for the other four categories of inputs. When the same procedure is employed with the use of 1966 weights, the residual approaches zero (0.25 percent). We judge this finding reflects the impact of official policies between 1959 and 1966 which led to a major increase in compensation to agricultural labor without a compensatory increase in its productivity. This virtual absence of a residual suggests the "capturing" by farm labor of most of the return to land. Growth of agricultural wages is the result of wage reforms designed to induce the farm labor force to put forth a higher quantity and quality of labor services. Between 1959 and 1966 the average annual wage on collective farms grew by 111 percent, while the average wage on state farms rose by over 46 percent. In contrast, the average wage in industry grew by less than 20 percent during this period. In the event, labor productivity in agriculture grew at a slower pace than in industry.

Assuming that the returns to labor in farm and industrial activity were roughly in equilibrium in 1959, the argument would follow that between 1959 and 1966 there was a divergency over time in the cost of the labor input—the basis for determining its weight in 1959—and the value of its marginal product. Accepting the proposition that this divergence was at the "expense" of the return to land, we have accepted two arbitrary alternatives, in distributing the returns between land and labor, of the joint value of compensation to labor and the nominal residual:

(*a*) The use of the ratio between the return to land and labor reported by Griliches for U.S. agriculture for 1940–60 of 31 percent. (Zvi Griliches, "The Sources of Measured Productivity Growth: United States Agriculture, 1940–60," *Journal of Political Economy*, August 1963, p. 331–46).

(*b*) The use of the proportional relationship obtained for 1959 in the earlier Diamond study which gave a ratio of land to labor of 21 percent (using an interest charge of 13 percent for fixed capital and productive livestock).

ESTIMATION OF THE SEVERAL COEFFICIENTS

	Assumption I [1]	Assumption II [2]
1. Livestock	.0287	.0287
2. Fixed capital	.1516	.1516
3. Current purchases	.1223	.1223
4. Labor and land	.6974	.6974
a. Labor	(.5321)	(.5760)
b. Land	(.1653)	(.1214)
Total inputs	1.0000	1.0000

[1] Ratio of land to labor equal to 31 percent.
[2] Ratio of land to labor equal to 21 percent.

Coefficients in columns 1 and 2 are obtained by dividing the payment to each of the factors of production by the total value of production for sale and home consumption of 57,437 million rubles. The sum total of the payments to the factors is equal to the value of output.

1. Livestock

Comprised of interest charges of 1,650 million rubles. These are imputed charges based on an assumed rate of return of 12 percent on total estimated value of productive herds of 13,750 million rubles, which is the mean of end-of-year value for 1965 and 1966 of 13,600 and 13,900 million rubles, respectively.

2. Capital

Charges for fixed capital are comprised of three items:

	(*Million rubles*)
(1) Depreciation charges on structures and equipment	2,343
(2) Interest on structures and equipment	6,247
(3) Interest on draft animals	119
Total	8,709

Depreciation charges were calculated at a rate of 4.5 percent; interest charges at a rate of return of 12 percent. The 1966 mean-year value of structures and equipment was estimated at 52,060 million rubles; the 1966 mean-year value of draft animals at 990 million rubles.

3. Current purchases

Current purchases of materials from non-agricultural sectors of 7,022 million rubles are derived from the 1966 Soviet Input-Output table as a residual, the difference between total current purchases by agriculture from all sectors of 28,335 million rubles and the sum of (1) purchases which are largely double-counted (trade, public dining, procurement, material-technical supply, and transport and communications) of 3,732 million rubles and (2) intra-sector purchases of 17,581 million rubles. (See Treml, *et al., op cit.*, p. 464–5.)

4. Labor and land

Assuming (as indicated above) that the return to labor reflects the joint return to labor and land, the aggregate weight is derived as the joint value of (1) wage bills (39.914 million rubles) and (2) the difference between total value of sales and home consumption for agriculture and the summation of the value of wage bills and the payments to the other factors, (142 million rubles).

The total wage bill is equal to the sum of (1) wages paid to the labor force engaged in a farm activity in state agriculture and collective farms, (2) sales by households of agricultural commodities, and (3) farm income-in-kind.

Wages for state agriculture of 8,504 million rubles were derived on the basis of the 1966 average annual wage of 957.6 rubles per annual average state agricultural worker (*Narkhoz 1967*, p. 657) plus payments to social insurance of 4.4 percent (V. Krilikoskyay, *et al. Planirovaniye byudzheta gosudarstvennogo sotsial'nogo strakhovaniya.* Moscow, 1959, p. 18) for a total return of 999.7 rubles per annual average worker times the number of annual average workers in state agricultural activity—8,507 thousand (inclusive of hired workers of 100 thousand). [See Appendix Table C–1 of the contribution by Feshback and Rapawy in this volume; for hired workers from non-agricultural establishments (so-called "attracted") see TsSU *Strana Sovetov za 50 let*, Moscow, 1967, p. 162–3.]

Wages of 10,130 million rubles paid by collective farms are the sum of payments made for farm activity of collective farm members—9,900 million rubles and of hired workers—230 million rubles. Estimates were derived on the basis of estimated total money payments of 10,900 million rubles made by collective farms to members for activity in all areas—farm, service, construction, and the like (David W. Bronson and Constance B. Krueger "The Revolution in Soviet Farm Household Income, 1953–1967" *The Soviet Rural Community*, edited by James R. Millar, University of Illinois Press, 1971, p. 241); the share assumed attributable to farm activity only—about 91 percent, the share that collective farm members engaged in farm activity represented of all collective farm members (16.9 million annual average workers out of a total of 18.6 million annual average workers) (*Strana Sovetov . . ., op. cit.*, p. 162–3); and the assumption that hired workers from outside of agriculture numbering 0.4 million (*Ibid.*) were paid at the same implied average annual wage of 586 rubles per worker (9.9 billion divided by 16.9 million).

The following returns to other types of farm labor are from unpublished estimates of the authors: share of net income from sale by households of farm products attributable to use of labor (5,680 million rubles) plus income-in-kind (15,600 million rubles).

Appendix B

Index of Agricultural Inputs

The weights shown in Appendix A, Section C, were moved over time by a series of volume indexes derived as follows:

Land: The measure for land is obtained by weighting total sown acreage by an index of weighted yields. The latter is based on a series obtained by dividing (1) the summation of the products of weighting annual sown average for each of 25 regions with the average grain yield for each region in 1960–70 by (2) the annual total sown area. This method ought to yield reliable results for two reasons: (1) the preponderance of grain acreage in total acreage (about 60 percent for the period 1960–70), and (2) the relative hemogeneity of at least three-fourths of the acreage with respect to prevailing climate and soil.

Livestock: The measure reflects the value of "productive" livestock (excluding draft animals) held as breeding stock or for purposes of producing a flow of services over a series of years (e.g., dairy cattle for milk, sheep for wool). The proportion of the herds that is comprised of young stock before the reproductive age or animals raised solely for slaughter is excluded. The value of such livestock is included as working capital in official accounting procedures.

Capital Stock: The index of capital stock reflects the gross value of fixed reproducible assets (buildings, structures, equipment) and draft animals. Values are expressed in replacement cost ("constant" 1955 price) gross of depreciation and net of retirements.

Purchase of Materials: The index of current purchases of materials from other sectors of the economy is comprised of seven series: (1) deliveries of fertilizer to farms, (2) use of electric power for productive purposes, (3) fuels and lubricants, (4) current repairs of machinery and buildings including repair activity carried out by the farms on their own account, (5) production of rubber products for agriculture, (6) production of processed feeds (millfeed, oilcake, skim milk, sugar beet pulp) by industry, and (7) use of lime. The separate series were aggregated by use of the actual expenditure weights for 1966 as included in the 1966 Soviet Input-Output Table. The sample of goods and services included in the index covers 85 percent of the total ruble outlays by farms for current purchases in the base year 1966.

Labor: The series constructed for the labor input is based on the actual expenditure of work-days in agricultural production (conventionally expressed in Western literature as "man-days"). It represents a measure of the volume of time spent directly in production of agricultural products—crops and livestock—and in associated administrative activities. The days are undifferentiated as to the age and sex of the persons employed. The coverage includes not only time worked by the persons principally engaged in agriculture but also embraces the input of days by persons of households whose head is principally engaged in non-agricultural activities but who maintains (in non-agricultural enterprises) small holdings (kitchen garden and/or small holding of livestock). Also included are days worked in farm activity by members of households attached to agricultural enterprises with a principal occupation in a non-farm production activity (e.g., capital repair, municipal service) but who have a secondary source of employment in farm production activity.

For a more detailed description of the concepts and coverage of the individual series see Diamond, *op. cit.*, p. 372–6.

The above series from which the volume indexes were derived are shown in Table B–1.

TABLE B-1.—U.S.S.R.: INDICATORS OF RESOURCES AVAILABLE TO AGRICULTURE, EXPRESSED IN RUBLE VALUES OR PHYSICAL UNITS, 1950, 1955, 1960–72, AND 1975 PLAN [1]

	1950	1955	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Plan 1975
Land:																
Annual sown acreage (millions of hectares)	146.3	185.8	203.0	204.6	216.0	218.5	212.8	209.1	206.8	206.8	207.0	208.6	206.7	207.3	207.3	206.7
Index of weighted yields [2] (1965=100)	106.7	102.3	100.0	100.2	99.7	99.3	99.8	100.0	100.0	100.0	99.8	99.4	99.6	99.5	99.5	99.6
Weighted acreages [3]	156.1	190.1	203.0	204.9	215.3	216.9	212.5	209.1	206.8	206.8	206.5	207.4	205.8	206.3	206.3	205.8
Productive livestock [4] (billion rubles, 1955 prices)	8.30	9.15	12.40	12.70	13.55	14.05	13.85	13.65	13.75	14.00	14.10	14.05	13.95	13.95	14.05	14.95
Capital stock [5] (billion rubles, 1955 prices)	13.10	19.90	31.40	34.20	37.40	40.95	44.75	48.90	53.05	57.15	61.90	67.10	73.25	80.40	88.65	122.90
Current purchases [6] (billion rubles, 1966 prices)	1.60	2.45	3.59	3.90	4.27	4.45	4.92	5.57	6.01	6.47	6.83	7.14	7.51	7.96	8.44	10.37
Labor [7] (million man-days)	10,784	10,860	10,155	10,171	10,136	9,803	9,856	10,334	10,310	9,974	9,795	9,657	9,744	9,662	9,662	9,279

[1] The data in this table represent the underlying ruble values or physical units presented in Table 2 as indexes. Because of rounding of the data in this table, the implied index numbers (1965 = 100) may not be comparable to those shown in Table 2 (computed from unrounded data).

[2] Index of the series for weighted yields which is obtained by dividing (1) the summation of the products of weighting annual sown acreage for each of 25 regions by the average grain yield for each region in 1960–70 by (2) the total sown area for each year.

[3] The product of annual sown acreage (line 1) and the index of weighted yields (line 2). Weighted acreages (line 3) are the basis of the index of land presented in Table 2.

[4] The mean-year inventory value (that is, mean of beginning and end-of-year values expressed in 1 July 1955 prices) of herds of mature "productive" animals excluding draft animals. Young animals and those being raised exclusively for slaughter are also excluded.

[5] The mean-year gross value (that is, mean of beginning and end-of-year values) of fixed assets (buildings, machinery and equipment, land improvements such as irrigation and drainage) and draft animals. Values are expressed in replacement cost (1 July 1955 prices) gross of depreciation and net of retirements.

[6] See above for categories of purchases included.

[7] All man-days expended in farm activity.

Appendix C

Alternative Indexes of Inputs

The index of total inputs and factor productivity shown in Table 2 of the text was based on a set of weights for the geometric index formula that reflected the return to land relative to labor of 31 percent. In App. Table *C–1* the index derived by use of the above land/labor ratio is compared to the index derived with a ratio of 21 percent. The latter rate was chosen to test for the sensitivity of the results to variations in the assumed contributions of land. Because of the generally parallel trend in the two input series, the overall conformation of trends in inputs and output per unit of input remained almost identical.

TABLE C-1.—U.S.S.R.: ALTERNATIVE INDEXES OF AGRICULTURAL OUTPUT PER UNIT OF INPUT, 1950, 1955, 1960–72, AND 1975 PLAN

[1965=100]

	1950	1955	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Plan 1975
Output (3-year moving average)	54	69	87	89	87	88	90	100	104	109	109	115	118	120	114	147
Total inputs:																
Assumption I [1]	68	79	87	89	92	93	95	100	102	102	103	104	107	108	111	117
Assumption II [2]	69	79	87	89	92	92	95	100	102	102	103	104	106	108	111	117
Factor productivity:																
Assumption I [1]	80	87	100	100	94	94	95	100	102	106	106	110	111	111	102	125
Assumption II [2]	79	86	100	100	94	95	95	100	102	107	106	110	111	111	103	126

[1] The coefficient or "weight" for land in the production function related to labor is equal to 31 percent.
[2] The coefficient or "weight" for land in the production function related to labor is equal to 21 percent.

APPENDIX D

INDEX OF AGRICULTURAL OUTPUT

The index shown in Table 2 of the text is based on the physical output of 41 crops and animal products, and changes in inventories of 4 classes of livestock, weighted by 1968 prices. App. Table D–1 presents the annual rates of growth. The cumulative indexes for crops and livestock are shown in App. Table D–2. In order to obtain a net measure of the physical amounts available for sale and home consumption, deductions were made for the amounts of grain, potatoes, sugar beets, and milk fed to livestock; for the quantity of eggs used for hatching; and for the amounts of grain and potatoes used as seed.

The sample reflected in the index is shown in App. Table D–3. For purposes of productivity accounting it would be appropriate to include in the concept of output changes from year to year in the inventory of farm commodities (including feedstuffs). Such data are available for socialized farms for selected years but are expressed in current ruble values aggregated in such a manner that deflation into "constant 1968 prices" is not feasible. Changes in stocks of farm commodities held by the Government are not published.

The physical commodities and livestock inventory series are official production data except for grains, sunflower seeds, individual vegetables, tobacco, makhorka, and silk cocoons. For grain and sunflower seeds, independent estimates that reflect downward adjustments of official data were used. For the vegetable group estimates of output of individual products were derived by using the relative shares of each type of vegetable in government purchases. The tobacco and makhorka series were estimated from government purchases data and historical evidence regarding the share that procurements of these commodities represent of production. Government purchases data for silk cocoons were assumed synonymous with production data.

For a fuller statement concerning the need for an adjustment of the official series of grain production see Diamond, *op. cit.*, p. 369.

Estimates of utilization of grain and potatoes as livestock feed were based on the net availabilities after deductions for other uses (industrial use, food, net exports, change in stocks). Estimates of sugar beets fed to livestock were derived as the difference between the annual output of sugar beets and the annual purchases for industrial processing.

In estimating the appropriate deduction from the gross value of livestock for the value of grain and sugar beets fed, it was assumed that one-third of the product used as feed from a given crop was fed during the calendar year in which it was produced and that two-thirds were fed during the following calendar year. Estimates of milk fed to livestock and amounts of grain and potatoes used as seed were based on official sources.

Price weights for 1968 were used in aggregating the output of farm products expressed in physical terms. These prices are the average realized prices received by all producers (collective farms, state farms and other state agricultural enterprises, and individual producers) for output sold through state procurement channels and the collective farm market and commission trade.

For further description of the indexes see Appendix B of the contribution by Whitehouse and Havelka in this volume.

TABLE D–1.—U.S.S.R.: INDEX OF NET AGRICULTURAL PRODUCTION, 1950–72

Year	Index[1] (1965=100)	Annual rate of growth[2] (percent)	Year	Index[1] (1965=100)	Annual rate of growth[2] (percent)
1950	57	0	1962	92	−2.6
1951	53	−6.4	1963	80	−12.8
1952	56	6.0	1964	97	20.9
1953	59	5.4	1965	100	3.5
1954	61	3.8	1966	109	9.4
1955	70	13.8	1967	109	−.6
1956	78	12.2	1968	115	5.6
1957	81	3.1	1969	110	−3.8
1958	88	8.2	1970	126	13.6
1959	86	−1.5	1971	126	.1
1960	87	.9	1972	116	−7.8
1961	94	8.1			

[1] Straight annual.
[2] Computed from unrounded data.

TABLE D-2.—U.S.S.R.: INDEXES [1] OF AGRICULTURAL PRODUCTION, 1950–72 AND 1975 PLAN
[1965 = 100]

Year	Total	Crops [2]	Livestock [3]
1950	57	71	44
1951	53	58	48
1952	56	69	45
1953	59	67	52
1954	61	69	55
1955	70	80	61
1956	78	93	66
1957	81	86	76
1958	88	96	80
1959	86	85	88
1960	87	86	88
1961	94	94	94
1962	92	88	95
1963	80	81	78
1964	97	108	86
1965	100	100	100
1966	109	116	103
1967	109	117	101
1968	115	126	105
1969	110	114	107
1970	126	131	121
1971	126	129	122
1972	116	116	116
1975 plan	150	155	140

[1] Straight annual.
[2] Crop production less adjustment for seed use of grain and potatoes.
[3] Livestock products, including also adjustment for changes in livestock inventories, less (1) the value of grain, potatoes, sugar beets, and milk fed to livestock, and (2) the value of hatching eggs.

TABLE D-3.—U.S.S.R. COMMODITY COMPOSITION OF AGRICULTURAL OUTPUT INDEX, 1950, 1955, 1960–72, AND 1975 PLAN[1]

	Unit	1950	1955	1960	1961	1962	1963	1964	1965
Grains, total[2]	MMT	81.2	103.7	93.0	109.5	109.0	92.0	120.0	100.0
Wheat	MMT	31.1	47.3	47.6	55.6	55.0	42.5	58.7	49.3
Rye	MMT	18.0	16.5	12.1	14.0	13.2	10.2	10.7	13.4
Barley	MMT	6.4	10.4	11.9	11.2	15.2	17.0	22.6	16.8
Oats	MMT	13.0	11.8	8.9	7.4	4.4	3.4	4.4	5.1
Corn for grain	MMT	6.6	11.6	7.3	14.3	12.1	9.5	10.9	6.6
Buckwheat	MMT	1.3	1.3	.5	.7	.7	.4	.6	.8
Rice	MMT	.2	.2	.1	.2	.2	.3	.4	.5
Millet	MMT	1.7	3.0	2.4	2.4	2.2	1.6	2.7	1.8
Pulses	MMT	2.0	1.3	2.0	3.4	5.9	6.9	8.8	5.5
Other	MMT	.9	.3	.2	.3	.1	.2	.2	.2
Potatoes	TMT	88,612	71,751	84,374	84,310	69,677	71,834	93,642	88,676
Vegetables, total[4]	TMT	9,344	14,100	16,574	16,151	15,989	15,051	19,467	17,627
Beets	TMT	589	818	878	711	688	697	895	917
Cabbage	TMT	4,364	6,119	6,613	6,137	6,140	5,879	7,125	6,504
Carrots	TMT	551	804	878	872	863	682	1,129	987
Cucumbers	TMT	626	1,269	1,956	1,631	1,487	1,515	2,219	1,410
Onions	TMT	533	973	1,376	1,421	1,471	1,000	1,246	1,639
Tomatoes	TMT	2,261	3,454	4,044	4,587	4,429	4,294	5,587	5,129
Other	TMT	420	663	829	792	911	984	1,266	1,041
Fruits, berries, and nuts	TMT	2,850	3,830	4,942	5,050	5,978	6,411	6,866	8,100
Sugar beets	TMT	20,819	31,049	57,728	50,911	47,435	44,052	81,174	72,276
Cotton and cottonseed	TMT	3,539	3,881	4,289	4,518	4,304	5,210	5,285	5,662
Fiber flax	TMT	255	381	425	399	432	380	346	480
Oilcrops:									
Sunflower seeds[5]	TMT	1,798	3,797	3,650	4,373	4,411	3,942	5,573	5,013
Soybeans	TMT	166	151	220	425	510	413	338	429
Flaxseed	TMT	65	104	65	80	90	90	90	85
Mustard seed	TMT	69	59	20	31	80	77	102	80
Castor beans	TMT	35	16	15	45	55	55	45	20
Other	TMT	145	120	20	9	5	5	5	6
Tobacco[7]	TMT	62	83	105	102	104	124	186	171
Makhorka[7]	TMT	95	111	73	36	33	31	46	46
Tea	TMT	85	121	164	162	179	196	194	197

See footnotes at end of table.

TABLE D-3.—U.S.S.R. COMMODITY COMPOSITION OF AGRICULTURAL OUTPUT INDEX, 1950, 1955, 1960–72, AND 1975 PLAN [1]—Continued

	Unit	1950	1955	1960	1961	1962	1963	1964	1965
Meat, total		4,867	6,324	8,682	8,700	9,462	10,195	8,287	9,956
Beef and veal	TMT	2,355	2,181	3,252	2,864	3,277	3,741	3,571	3,917
Pork	TMT	1,478	2,529	3,276	3,704	4,011	4,267	2,813	4,143
Mutton and kid	TMT	690	826	1,019	1,006	1,062	1,119	1,052	1,013
Poultry meat	TMT	278	455	766	813	822	802	606	696
Other	TMT	66	333	369	313	290	266	245	187
Milk	TMT	35,311	43,000	61,718	62,565	63,931	61,248	63,262	72,563
Eggs	Million eggs	11,697	18,500	27,464	29,309	30,089	28,523	26,694	29,068
Wool	TMT	180	256	357	366	371	373	341	357
Honey	TMT	182	206	211	248	205	219	214	192
Silk cocoons [9]	TMT	25	24	30	29	31	34	33	35
Changes in number of livestock:									
Cattle	Th. head	−1,011	2,214	1,625	6,297	4,911	−1,540	1,723	6,265
Hogs	Th. head	2,172	3,082	5,306	8,028	3,262	−29,106	11,985	6,733
Sheep and goats	Th. head	5,353	3,276	−3,660	4,194	1,912	−10,759	−8,886	4,642

	Unit	1966	1967	1968	1969	1970	1971	1972	Plan 1975
Grains, total [2]	MMT	140.0	122.0	134.6	128.0	149.9	148.3	134	167
Wheat	MMT	82.2	63.9	74.3	63.0	80.1	80.8	[3]	[3]
Rye	MMT	10.8	10.7	11.2	8.6	10.4	10.5	[3]	[3]
Barley	MMT	22.8	20.3	23.0	25.8	30.7	28.3	[3]	[3]
Oats	MMT	7.5	9.6	9.3	10.3	11.4	11.9	[3]	[3]
Corn for grain	MMT	6.9	7.6	7.0	9.4	7.6	7.0	[3]	[3]
Buckwheat	MMT	.8	1.0	1.2	1.1	.9	1.0	[3]	[3]
Rice	MMT	.6	.7	.8	.9	1.0	1.2	[3]	[3]
Millet	MMT	2.5	2.7	2.1	2.6	1.7	1.7	[3]	[3]
Pulses	MMT	5.8	5.4	5.7	6.2	6.1	5.7	[3]	[3]
Other	MMT	.1	.1	0	.1	0	.2	[3]	[3]
Potatoes	TMT	87,853	95,464	102,184	91,779	96,783	92,655	77,700	112,200
Vegetables, total [4]	TMT	17,857	20,534	19,011	18,745	21,212	20,838	19,100	27,200
Beets	TMT	1,018	1,006	1,046	1,125	1,188	1,167	[3]	[3]
Cabbage	TMT	6,054	7,577	6,369	6,298	7,488	7,356	[3]	[3]
Carrots	TMT	964	1,047	1,103	1,331	1,294	1,271	[3]	[3]
Cucumbers	TMT	1,750	2,053	1,787	1,725	2,291	2,250	[3]	[3]
Onions	TMT	1,661	1,417	1,559	1,575	2,015	1,980	[3]	[3]
Tomatoes	TMT	5,143	6,078	5,893	5,436	5,558	5,460	[3]	[3]
Other	TMT	1,267	1,356	1,254	1,255	1,378	1,354	[3]	[3]

Fruits, berries, and nuts	TMT	7,805	8,966	10,621	9,467	11,690	12,307	[3]	18,910
Sugar beets	TMT	74,037	87,111	94,340	71,158	78,324	72,185	74,600	92,400
Cotton and cottonseed	TMT	5,981	5,970	5,945	5,708	6,890	7,101	7,300	7,200
Fiber flax	TMT	461	485	402	487	456	485	460	556
Oilcrops:									
Sunflower seeds [5]	TMT	5,650	6,079	6,150	5,849	5,652	5,210	5,000	6,783
Soybeans	TMT	638	553	532	353	629	618	[3]	981
Flaxseed	TMT	100	100	100	90	65	64	[3]	260
Mustard seed	TMT	100	80	75	70	50	49	[3]	0
Castor beans	TMT	45	90	106	60	79	78	[3]	198
Other	TMT	7	7	7	7	7	7	[3]	[6] 128
Tobacco [7]	TMT	180	217	217	197	230	230	[3]	320
Makhorka [7]	TMT	40	35	49	42	33	24	[3]	46
Tea	TMT	238	234	229	245	273	280	[3]	303
Meat, total		10,704	11,515	11,648	11,770	12,278	13,300	13,600	16,000
Beef and veal	TMT	4,377	5,081	5,513	5,569	5,393	5,500	[3]	[3]
Pork	TMT	4,465	4,456	4,079	4,094	4,543	5,300	[3]	[3]
Mutton and kid	TMT	933	1,028	1,029	969	1,002	1,000	[3]	[3]
Poultry meat	TMT	745	764	817	866	1,071	1,200	[3]	[3]
Other	TMT	184	186	210	272	269	300	[3]	[3]
Milk	TMT	75,992	79,920	82,295	81,540	83,016	83,183	83,200	100,000
Eggs	million eggs	31,672	33,921	35,679	37,190	40,740	45,100	48,200	52,000
Wool	TMT	371	394	415	390	419	429	419	500
Honey	TMT	228	211	204	179	210	210	[3]	[8] 210
Silk cocoons [9]	TMT	35	37	36	36	34	37	[3]	[10] 42
Changes in number of livestock:									
Cattle	Th. head	3,675	56	−1,432	−573	4,063	3,209	1,600	1,700
Hogs	Th. head	−1,548	−7,161	−1,820	7,008	11,428	3,951	−4,900	2,000
Sheep and goats	Th head	5,726	2,999	2,100	−10,338	7,618	1,912	−800	3,300

[1] Soviet official data unless otherwise indicated. Major sources are as follows: 1950–71—TsSU "Sel'skoye khozyaystvo SSSR, statisticheskiy sbornik," Moscow, 1971; annual editions of "Narodnoye khozyaystvo SSSR"; TsSU "Sel'skoye khozyaystvo SSSR, statisticheskiy sbornik," Moscow, 1960.

1972—Plan fulfillment report for 1972, "Izvestiya," 30 Jan. 1972; "Ekonomika sel'skogo khozyaystva," No. 2, 1973, p. 8.

1975 Plan—"Gosudarstvennyy pyatiletnyy plan razvitiya khozyaystva SSSR na 1971–1975," Moscow, 1972.

[2] Estimate of usable grain. Net usable grain is estimated as the official gross output minus excess moisture, unripe and damaged kernels, weed seeds, and post-harvest losses incurred in the loading and unloading of grain between the combine and storage facilities. Estimates of net production of grain have reflected a reduction of between 14 percent (1963) and 26 percent (1960) in the official claims for gross output of grain. Official data of the 1975 Plan were discounted by the average of annual discounts used in 1966–70.

[3] Not available.

[4] Estimates of output of individual products were approximated by applying to official data for output of total vegetables the relative shares of each type of vegetable in government purchases. These shares are available for 1950 and 1960 through 1970 in TsSU "Sel'skoye khozyaystvo SSSR, statisticheskiy sbornik," Moscow, 1971, p. 70.

[5] Official data for gross output have been reduced by about 8 percent to allow for excess tonnage in the form of moisture and trash that results when "bunker weight" (i.e., as measured in the harvesting machine) is used in determining the size of the harvest.

[6] Including mustard seed.

[7] Approximated on the assumption that the official government purchases data represent all but 1 percent of production of tobacco and all but 3 or 4 percent of total production of makhorka. These represent the observed shares for selected years.

[8] Assumed at the annual average level of output for 1961–70.

[9] Official state purchase series.

[10] Estimated at about 15½ percent above the 1971 level on the basis of the increase planned for procurements from the three major producing Republics—Uzbek, Tadzhik, and Turkman. Republic plan data are from "Gosudarstvennyy pyatiletnyy plan razitiya khozyaystava SSSR na 1971–1975," Moscow, 1972.

COMPARISON OF FARM OUTPUT IN THE US AND USSR, 1950–1971

By F. Douglas Whitehouse *and* Joseph F. Havelka

CONTENTS

I. Introduction

In November, 1971, Premier Kosygin declared that the volume of Soviet agricultural production in 1975 would exceed the 1970 level of agricultural production in the United States. While such statements have not been heard from the Soviet leadership since 1957, when Khrushchev launched a campaign to overtake the US in per capita production of meat and milk, Kosygin's claim is not surprising. Agricultural production has been increasing much faster in the USSR than

in the US over the past two decades and the exceptionally good harvest in 1970 brought Soviet farm output to about 89% of US production—the closest the USSR ever has come to closing the gap with US production.

This paper compares the volume growth of agricultural output and its major components in the United States and the Soviet Union in 1950–71. The aim of this paper is thus to present measures of farm output, that will (1) provide the best available comparison of production in the two countries, and (2) assess the changes that have occurred in Soviet and US agriculture during the last two decades. In the paper, an attempt also is made to provide both an historical and comparative frame of reference which may be useful in assessing major fluctuations in Soviet farm output. Part II describes the relative importance of agriculture in the overall economy of each country. Part III compares relative levels and growth of agricultural output in the two countries in 1950–71 and selected subperiods. Part IV describes differences in farm technology between the US and USSR, and Part V assesses the outlook for production through 1975.

As much care as possible has been taken to ensure the comparability of the value series of farm output presented herein.[1] Since the emphasis of this paper is on production, no adjustments were made for quality differences in *marketed* production (i.e., quality differences arising from post-harvest methods of distribution and handling). An attempt is made in Appendix A, however, to show the impact of possible adjustments for inherent quality differences in some products. An assessment of the comparisons and the methodology used to derive the comparisons is contained in the first two appendices to this paper.

II. Agriculture's Role in the US and Soviet Economies

Agricultural production has a much greater impact on overall economic performance in the USSR than in the US. Although the farm sector's contribution to gross national product (GNP) has fallen rapidly over time, farm output in the USSR still accounts for more than one-fifth of the Soviet GNP and employs nearly one-third of the labor force. In the US, on the other hand, agriculture contributes just 3½% of GNP and employs only 5% of the labor force. The share of the labor force employed in agriculture has dropped in both countries, but at a much slower rate in the USSR than in the US.

[In percent]

	1950		1960		1971	
	United States	U.S.S.R.	United States	U.S.S.R.	United States	U.S.S.R
Agriculture's share of GNP	5.5	38.4	4.5	29.4	3.5	22.4
Agriculture's share of labor force	15.3	51.0	9.8	42.1	5.1	29.3

Of all sectors of the American and Soviet economies, agriculture offers one of the greatest contrasts in terms of organization and efficiency. Although American agriculture contributes a relatively small proportion of US GNP, the US provides large quantities of food for the domestic and foreign markets and is still troubled by

[1] The authors are greatly indebted to Constance B. Krueger, who did the research on Soviet prices used in this paper, and to Elizabeth Meier, who carried out the statistical calculations for the comparisons.

problems of overproduction. The USSR, on the other hand, still has not managed to produce the quantity and quality of farm products desired by its population. On balance, the Soviet Union is a net importer of agricultural commodities, and has spent enormous sums on programs to boost agricultural production.

In other respects American and Soviet agriculture are similar. Both countries have very large expanses of farm land relative to their populations. The USSR has more than twice the land area of the US, but only about ⅓ more arable land, as only 11% of the USSR's land mass is suitable for farming. Most of the farm land of both countries lies in the north temperate zone. The USSR, however, is less favorably situated because of its more northerly location and because much of its "high plains" is marginal from the standpoint of rainfall. The USSR, moreover, has no cropland corresponding to the American cornbelt. The combination of fertile soil, adequate moisture, and a reasonably long growing season which characterizes the US corn belt is not found in the USSR where low temperature and overmoist lands prevail in the north and aridity penalizes the south. The harsher Soviet climate often endangers winter crops while the shorter growing season sometimes brings the harvest to an untimely close. As a result, annual fluctuations in the level of farm output in the USSR are larger than in the US.

Because food accounts for nearly 50% of total consumption in the USSR and carry-over stocks are generally inadequate, fluctuations in farm output greatly affect the Soviet ability to maintain an uninterrupted rise in the level of living of its population. In the US, in contrast, food products make up less than ⅕ of total consumption, the growth of farm output has been relatively steady, and stocks of many products are generally more than adequate to cushion the effects of minor variations in supply.[2] Therefore, changes in the rate of growth of consumption depend for the most part on developments outside of agriculture—notably cyclical changes in consumer purchases of durables and housing.

About 85% of total farm output is consumed within the country in both the US and USSR. In the US, however, more than ¾ of farm output destined for personal consumption is processed in industry while less than 60% of Soviet farm output is industrially processed (see Figure 1).[3] The composition of processed farm output also differs between the two countries, as shown in the following tabulation.

SHARE OF FARM OUTPUT DELIVERED TO INDUSTRY[1]

[In percent]

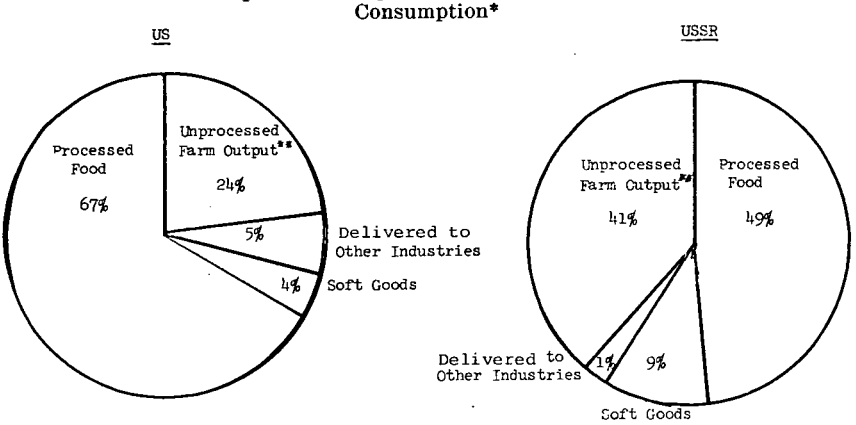
Industry	Crop production		Livestock products	
	United States	U.S.S.R.	United States	U.S.S.R.
Processed food	47	42	75	48
Soft goods	5	9	2	6
Other	9	5	5	4
Total	61	56	82	58

[1] Based on 1963 and 1966 input-output tables for the United States and U.S.S.R., respectively.

[2] These ratios express the value—in rubles and dollars respectively—of food purchases at retail relative to the value of total goods and services purchased by households.

[3] These data are derived from input-output tables for the US and USSR in 1963 and 1966 respectively. The remaining 15% is exports and inventory changes.

FIGURE 1.—Composition of Agricultural Output Used for Personal Consumption*



* Based on 1963 and 1966 input-output tables for the US and USSR respectively.
**Farm output consumed by producers or sold directly to households without passing through the industrial sector.

In the US, processing industries take 82 percent of the livestock and livestock products produced on American farms and 61 percent of the crop production. The USSR sends to industry nearly equal proportions of its crop and livestock output, 56 percent and 58 percent respectively. The rest of the production is processed at home and is consumed by producers or is sold directly to households.

III. FARM PRODUCTION IN THE US AND USSR, 1950–71

A. *Summary of Trends in Total Production*

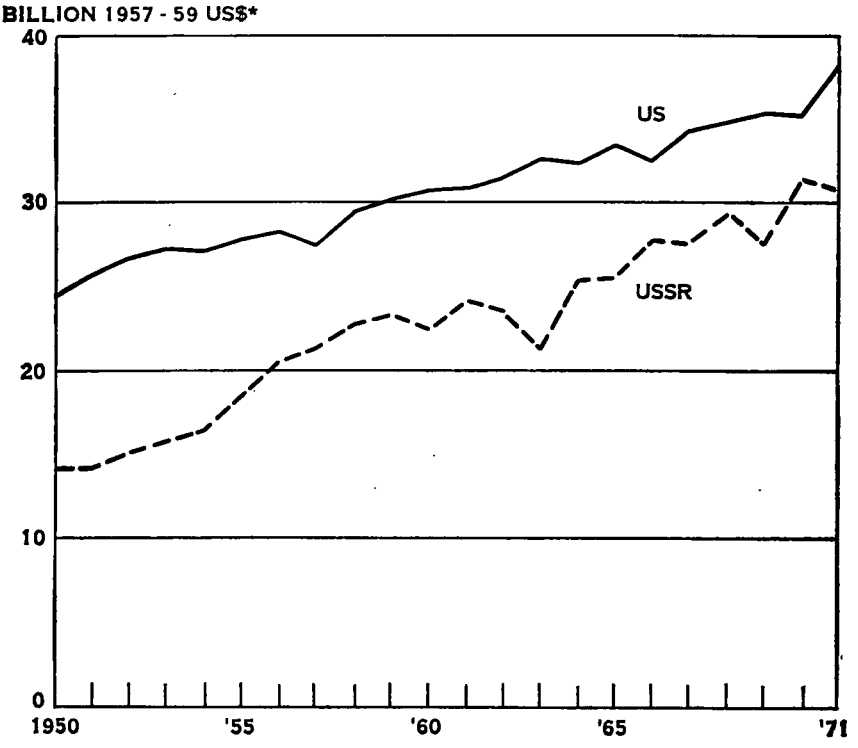
In 1950, the USSR produced about 14 billion dollars worth of farm products, approximately 61 percent as much as the US.[4] On a per capita basis, the Soviet agricultural sector, having a larger population to feed, produced only 49 percent as much as the US. Since the early 1950s, successive Soviet regimes have strived to increase farm output and farm efficiency in order to raise levels of living while reducing the enormous commitment of manpower to agriculture. Although the response has been far less than planned, Soviet agriculture has made substantial progress.

Soviet agricultural production has grown more rapidly than US farm output over the past 20 years. Most of the gain in Soviet production relative to that in the US occurred between 1953 and 1958 as

[4] Farm output includes all agricultural commodities produced on the farm less crops grown exclusively for seed purposes, the value of products fed to livestock, and hatching eggs. This provides a measure of final commodities produced by the agricultural sector. The percentage comparisons shown throughout the text of this paper are geometric averages of two separate measures of relative sizes of US and USSR agricultural output; one calculated in average 1957-59 dollar prices and the other calculated in 1968 ruble prices. Soviet values in dollars shown in the text are derived by applying the geometric mean of the ruble and dollar comparisons to the US dollar values. The procedure and the meaning of the results are discussed in Appendix A. Since no allowance is made for differences in quality of products in constructing these comparisons, the results may overstate somewhat the position of the USSR relative to the US. However, in Appendix A, an attempt is made to show the effect of possible differences in the quality of some products.

FIGURE 2.

Total Farm Output



*USSR data calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.

the USSR opened its "new lands" to cultivation [5] (see Figure 2). Since 1958, Soviet agricultural performance has been erratic. In 3 of the years between 1958 and 1963, Soviet output declined, while US production increased steadily. Agricultural output sputtered in the USSR during this period in part because yields in the "new lands" deteriorated as the result of cropping practices which led to severe weed infestation and threatened to reduce some areas to a dust bowl. In 1963, the USSR experienced an exceptionally poor weather year.[6]

After 1963, Soviet farm production rebounded to a record high in

[5] The "new lands" program, launched in 1954, contributed significantly to the growth of Soviet agriculture. Production of grain from the "new lands" accounted for about 14% of total Soviet grain production during 1954-58.

[6] Conditions for agricultural production were extremely poor in both the European USSR and in the "new lands" areas of Siberia and Kazakhstan, and the drop of 17 million tons in grain output forced the USSR to import 14 million tons of wheat from the West in the next 2 years.

1964 and continued to trend upward through 1971. Between 1965 and 1971, Soviet farm output increased by 23%. Meanwhile, US production, which had increased steadily between 1957 and 1963, dropped slightly in 1964, recovered the following year, and grew by 15% from 1965 to 1971. Thus, Soviet farm output, which remained at about ¾ of the US level during the late fifties and early sixties, increased to about ⅘ of the US level by 1971. Since the population of each country has grown at about the same rate over the past two decades, the gap between per capita production in the US and USSR has been reduced appreciably. In 1971, per capita farm output in the USSR was 68% of US production per capita compared with 49% in 1950.

Between 1950–55 and 1966–71 the average annual production of both crops and livestock products increased faster in the USSR than in the US. In the USSR, however, the increase in livestock production relative to crops was much greater than in the US in terms of either gross or net livestock production.[7] As a result, Soviet net livestock production has increased as a share of total output from 36% in 1950 to 48% in 1971 while in the US the share of net livestock production has remained at about 43% to 44%.

GROWTH IN FARM OUTPUT BETWEEN 1950–55 AND 1966–71

	Billion 1957–59 dollars[1]		
	Average, 1950–55	Average, 1966–71	Index (1966–71)/ (1950–55)
Net farm output:			
United States	26.6	35.1	132
U.S.S.R.	15.9	29.2	184
Crop production:[2]			
United States	14.9	19.4	130
U.S.S.R.	10.2	16.8	165
Gross livestock production:			
United States	16.4	21.2	129
U.S.S.R.	7.4	16.0	216
Net livestock production:[2]			
United States	11.7	15.7	135
U.S.S.R.	5.8	12.3	212

[1] Data for USSR calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.
[2] USSR components do not add to totals due to use of geometric mean comparisons for individual products.

B. Production of Crops

COMPARISON OF CROPLAND

The growth of Soviet crop production has depended heavily on increases in sown area, while the US has been reducing the area under cultivation and struggling with farm surpluses. The total area sown

[7] Gross livestock production includes the value of all products derived from livestock as well as the value of changes in the weight of livestock herds. Because it includes that portion of crop production fed to livestock herds, however, gross livestock production overstates the relative contribution of this sector to total farm output. Net livestock production, is gross livestock production less grain, potatoes, sugar beets, and milk fed to livestock and hatching eggs. Thus, the use of net livestock production in the comparisons of agricultural output in the US and USSR provides a better measure of the relative contribution of each sector (crops and livestock products) to total farm output.

to crops in the USSR is now about 73% greater than in the US (see Table 1).[8]

TABLE 1.—US-USSR: DISTRIBUTION OF SOWN AREA, SELECTED YEARS[1]

[Millions of acres]

	United States			U.S.S.R.		
	1950	1960	1971	1950	1960	1971
Wheat	61.6	51.9	48.4	95.1	149.2	158.1
Rye	1.8	1.7	1.8	58.3	40.0	23.5
Rice	1.6	1.6	1.8	0.2	0.2	1.0
Buckwheat	0.2			7.4	3.5	4.4
Total food grains	65.2	55.2	52.1	161.0	192.9	187.0
Corn	72.4	71.4	63.8	11.9	12.6	8.2
Oats	39.3	26.6	15.7	40.0	31.6	23.7
Barley	11.2	13.9	10.1	21.3	29.9	53.4
Other[2]	10.4	15.6	16.6	20.0	18.6	19.0
Total feed grains	133.2	127.5	106.3	93.2	92.7	104.3
Potatoes	1.7	1.4	1.4	21.2	22.5	19.5
Vegetables	1.6	1.6	1.6	3.2	3.7	3.7
Fruits, berries, and nuts	3.3	2.8	3.2	3.4	7.2	9.4
Sugar beets	.9	1.0	1.3	3.2	7.5	8.2
Sugarcane	.4	.3	.5			
Total sugar crops	1.3	1.3	1.9	3.2	7.5	8.2
Tobacco	1.6	1.1	.8	2.5	[3]2.5	[3]2.5
Cotton	17.8	15.3	11.5	5.7	5.4	6.8
Soybeans for beans	13.8	23.7	42.4	[4]	[4]	[4]
Sunflower seeds	[4]	[4]	[4]	8.9	10.4	11.1
Other oilseeds	6.8	4.9	3.1	4.6	2.4	3.9
Total oil crops	20.6	28.6	45.5	13.5	12.8	15.0
Forage crops[5]	85.1	78.0	76.1	51.1	155.9	161.1
Miscellaneous[6]	4.9	3.0	1.0	6.9	5.7	4.1
Total crop acreage	336.4	315.8	301.4	364.9	508.8	521.6

[1] US data from USDA, Agricultural Statistics, 1972. USSR data from Tsentral'noe statisticheskoe upravlenie, Narodnoe khozyaystvo SSSR, 1922–72 and Sel'skoe khozyaystvo SSSR Moscow, 1971.
[2] Millet and pulses for the USSR and grain sorghum for the US.
[3] Estimated.
[4] Not available; included in other oil seeds.
[5] Includes roots, corn for silage, and other forage grasses.
[6] Residual (reported total less sum of components).

Between 1950 and 1971 total sown area in the USSR increased by nearly 157 million acres, while sown area in the US declined by 35 million acres. Most of the increase in sown area in the USSR (96 million acres) occurred between 1953 and 1958 when the USSR added about 70 million acres in the "new lands" area of Siberia and Northern Kazakhstan.

While the largest share of total cropland in both countries is sown to grain (53% in US and 56% in USSR), the USSR plants most of its grain acreage in food grains (notably wheat and rye) while the US has more than twice as much area in feed grains (particularly corn) as in food grains. Of the remaining crops, only soybeans, sugarcane and cotton occupy more area in the US than in the USSR. In the USSR, the exceptionally large increase in cropland used for forage between 1950 and 1960 was mainly the result of plowing up permanent meadows and pastures and reducing idle and fallow lands, primarily to expand sowings of corn.

[8] The Soviet definition of "sown area" corresponds more closely to the US definition of "harvest area". Thus, the data referred to here and in Table 1 actually reflect harvested acreage in both countries.

COMPOSITION OF CROP OUTPUT

Feed grains comprise more than ⅓ of US crop production while the USSR stresses food grains and potatoes (see Table 2). The USSR now harvests nearly twice as much wheat as the US but only about 5% as much corn.[9] To support its livestock program, however, the USSR has had to use as much as one-third of its wheat for livestock feed in recent years.

TABLE 2.—US-USSR: CHANGES IN THE STRUCTURE OF CROP PRODUCTION

[Percent][1]

	United States[2]			U.S.S.R.[3]		
	1950	1960	1971	1950	1960	1971
Feed grains	31	34	36	12	11	12
Food grains	14	16	16	24	23	25
Potatoes	3	3	3	40	32	24
Vegetables	12	10	8	5	8	7
Fruits, berries, and nuts	10	8	8	3	5	9
Sugar crops	2	1	2	3	7	6
Cotton and cottonseed	12	14	9	7	7	8
Tobacco	8	6	5	1	1	1
Oil crops	7	8	13	2	3	4
Miscellaneous	(4)	(4)	(4)	3	4	3

[1] Components may not add to 100 percent due to rounding.
[2] In dollar prices.
[3] In ruble prices.
[4] Negligible.

Although vegetable production now accounts for about the same share of crop output in both countries, American farmers turn out a far greater variety of fresh vegetables than their Soviet counterparts. In the USSR, six vegetables—beets, cabbage, carrots, cucumbers, onions, and tomatoes—comprise 85% of total vegetable production while these same crops account for only 30% of US vegetable production. Soybeans dominate US production of oil crops (86% in 1971); sunflower seeds account for nearly 82% of Soviet oil crops.[10]

Since 1950, the most significant changes in the composition of crop production in the US were the large increase in the share of oil crops (primarily soybeans) and the decline in cotton production. In the USSR, the relative importance of potato production in total crop output declined by 16 percentage points between 1950 and 1971, while there was a large increase in the share of fruits and berries.

SIZE COMPARISONS

Soviet crop production, which averaged 68% of US production in 1950–55, increased to 87% of US crop output in 1966–71. Most of the gain in Soviet crop production relative to the US occurred during the 1950s, especially during 1954–56 when the "new lands" were being plowed (see Figure 3). Production of wheat in the "new lands" relieved the pressure on the traditional agricultural areas for production of food grains and permitted an expansion of the area planted to corn and other feed crops as well as some technical crops in the more humid areas of the European USSR.[11] With the exception of

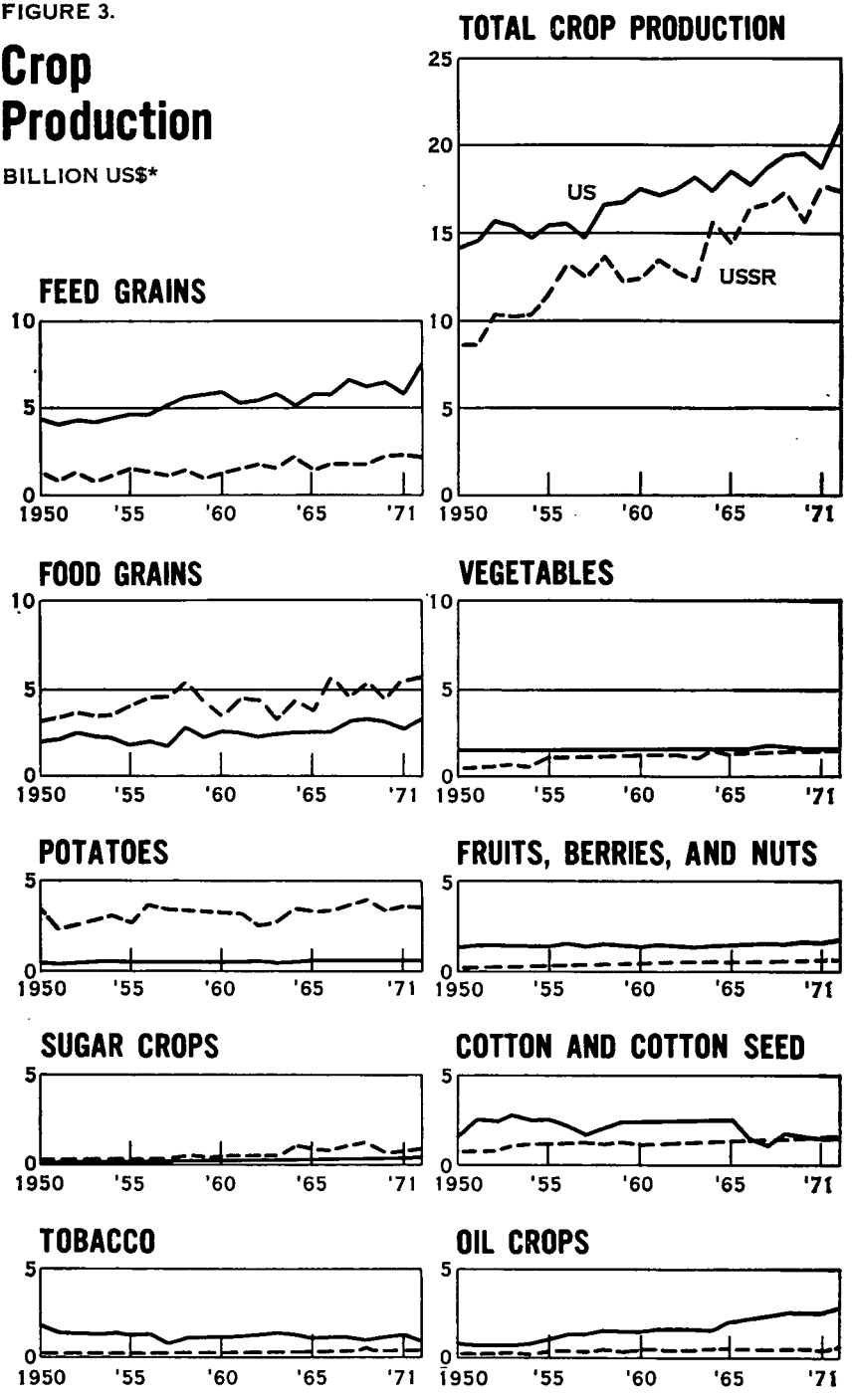
[9] See also Appendix Table C-5.
[10] As in Table 2, oil crops exclude cottonseed.

NOTE.—See footnote 11, p. 349.

FIGURE 3.

Crop Production

BILLION US$*



*USSR data calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollars and ruble prices.

feed grains and oil producing crops, all major categories of crop production in the USSR increased substantially relative to US production during the late 1950s (see Table 3).

TABLE 3.—US-USSR: COMPARISON OF ANNUAL AVERAGE CROP OUTPUT, SELECTED PERIODS, 1950–71

[In billion 1957–59 dollars] [1]

	United States [2]				U.S.S.R.[2]			
	1950–55	1956–60	1961–65	1966–71	1950–55	1956–60	1961–65	1966–71
Feed grains	4.30	5.34	5.52	6.57	1.15	1.30	1.85	2.15
Food grains	2.19	2.39	2.55	3.13	3.56	4.64	4.08	5.44
Vegetables	1.71	1.70	1.71	1.75	0.79	1.15	1.36	1.63
Potatoes	0.41	0.46	0.49	0.56	2.92	3.55	3.30	3.79
Fruits, berries, and nuts	1.38	1.40	1.43	1.63	0.23	0.33	0.48	0.73
Sugar crops	0.21	0.24	0.33	0.38	0.30	0.57	0.65	1.01
Cotton and cottonseed	2.50	2.28	2.64	1.72	0.93	1.17	1.32	1.68
Tobacco	1.27	1.08	1.26	1.07	0.14	0.18	0.20	0.29
Oil crops	0.91	1.32	1.74	2.50	0.31	0.43	0.58	0.72
Miscellaneous crops	0.06	0.06	0.06	0.06	0.32	0.52	0.46	0.60
Total crops	14.94	16.27	17.72	19.36	10.17	12.87	13.77	16.77

[1] Calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.

[2] Components of US output may not add to total output because of rounding while components of USSR output will not add to the totals due to the use of geometric mean comparisons for individual products.

As suggested earlier, the lack of any significant increase in Soviet crop production relative to the US in the early 1960s can be attributed in part to changes in cropping practices in the "new lands" areas and in part to a decline in the quality of labor services between 1958 and 1962.[12] These factors coupled with a severe drought in 1963 led to a reduction in the output of most major crops relative to US production. Food grains were particularly hard hit as the drastic drop in Soviet production in 1963 coincided with a slight increase in US production. Only feed grains, spurred on by record harvests of corn in 1961 and 1962, increased substantially relative to US production.

Since 1965, Soviet crop production has trended upward because of higher yields. More fertilizer, better varieties, more agricultural machinery, better tilage practices, and greater incentives for agricultural workers and managers have contributed to increased output per acre. In 1966–71, annual average Soviet crop production was 22% above average production in 1961–65. In the US, on the other hand, average crop production during 1966–71 increased only 9% compared with 1961–65. The increase in US crop production in the late 1960s was the result of higher yields, particularly among the major grains, and a 4% increase in harvested cropland.

The net increase in crop production in the USSR between 1950–55 and 1966–71 was half again as large as the growth in US crop production. As shown in the following tabulation, the largest increase in Soviet crop production occurred in food grains, although feed grains, vegetables, potatoes, and cotton also increased substantially.

[11] The size of the harvest varies in the "new lands", especially in the Kazakh SSR, because of extreme annual fluctuations in the amount and distribution of rainfall. Nevertheless, the "new lands" generally have provided a hedge against national crop failure because poor crop prospects in the traditional grain area of the European USSR frequently are offset by favorable prospects in the "new lands" and vice versa. For example, in 1956, the bumper crop produced in the "new lands" offset the poor grain crop produced in the other areas. This situation also occurred in 1972, although the grain harvest in the "new lands" areas did not compensate completely for the poor harvest in other areas.

NOTE.—See footnote 12, p. 350.

CHANGES IN ANNUAL AVERAGE CROP PRODUCTION BETWEEN 1950-55 AND 1966-71

[In billion 1957-59 dollars]

	United States	U.S.S.R.
Feed grains	2.27	1.00
Food grains	0.94	1.88
Vegetables	0.04	0.84
Potatoes	0.15	0.87
Fruits, berries, and nuts	0.25	0.50
Sugar crops	0.17	0.71
Cotton and cottonseed	−0.78	0.75
Tobacco	−0.20	0.15
Oil crops	1.59	0.41
Miscellaneous crops	0	0.28
Total crops	4.42	6.60

In the US, on the other hand, gains were concentrated in feed grains and oil crops (primarily soybeans), while the production of cotton and tobacco in the US declined as much as Soviet production of these commodities increased.

C. Production of Livestock Products

COMPARISON OF HERD NUMBERS

Since 1950, the USSR has made good the losses to its livestock inventories that occurred during forced collectivization in the early 1930s and during World War II. As crop production increased and feed supplies improved, inventories were restored gradually to their 1928 levels: the number of hogs by 1953, of sheep by 1956, all cattle by 1958, and cows by 1959.

By 1971 livestock herds were about equal in the US and the USSR; as the following tabulation shows, the Soviets then had 87% as many cattle, 78% as many cows, 6% more hogs, and 6½ times as many sheep and goats as American farmers had.

[In million head]

	United States			USSR		
	1950	1960	1971	1950	1960	1971
All cattle[1]	78	96	115	58	74	99
of which Cows[2]	41	46	52	25	34	41
Hogs[3]	59	59	64	22	53	68
Sheep and goats[4]	32	37	22	94	144	143
Total animal units[5]	76	91	105	59	82	104

[1] USSR data includes buffaloes and yaks.
[2] US data includes heifers 2 years old and over which have not yet calved; during 1965-70, these averaged 4.2 percent of the cows and heifers that had calved.
[3] US data for Jan. 1971 was estimated on the basis of annual changes in Dec. 1, 1970 numbers.
[4] US data includes sheep and lambs plus the number of goats clipped for mohair.
[5] The above numbers of livestock were aggregated using the following official Soviet weights to obtain an overall measurement of livestock herds: all cattle, 0.8 (cows, 1); hogs, 0.18; and sheep and goats, 0.09. These weights generally reflect the different sizes (weight per animal) and overall feed requirements of the various classes of livestock. These comparisons, however, do not take into account differences in the age-sex composition of US and Soviet herds. While the available data indicate that US herds are composed of a relatively larger share of mature breeding animals than Soviet herds, sufficient data are not available for a strict comparison of U S and Soviet herds by age-sex groupings.

In comparing herd numbers, it should be kept in mind that in the US only about ¼ of all cows are milked; the rest are beef cows, bred

[12] For a more complete treatment of these points see Douglas B. Diamond, "Trends in Output, Inputs, and Factor Productivity in Soviet Agriculture", Joint Economic Committee, *New Directions in the Soviet Economy, Part II-B*, Washington, 1966, p. 357-363.

and used exclusively for rearing calves. In the USSR, in contrast, practically every cow is milked. About 60% of Soviet cattle are dual-purpose animals, and only about ⅓ are rated as dairy types.

In terms of animal units, livestock herds increased by 76% between 1950 and 1971 in the USSR and by 38% in the US. The most striking change was in the number of hogs, which rose by 45 million in the USSR and by only 5 million in the US. During the two decades, sheep and goat herds grew by more than 50% in the USSR and declined by more than 30% in the US and the number of cows also increased much faster in the USSR than in the US.

COMPOSITION OF LIVESTOCK OUTPUT

Differences in the composition of livestock herds and feed supplies are reflected in the types of livestock products produced in the two countries. Meat comprises a smaller share of livestock output in the USSR than in the US, and—as the following tabulation shows—milk and wool, a larger share.

PERCENT OF TOTAL LIVESTOCK OUTPUT[1]

	United States			USSR		
	1950	1960	1971	1950	1960	1971
Beef and veal	29	33	38	25	21	25
Pork	22	18	17	19	22	23
Other red meat[2]	2	2	1	7	7	4
Poultry meat	5	9	12	3	4	4
Milk[3]	30	28	22	34	31	29
Eggs	11	10	10	6	8	9
Wool[4]	1	1	(5)	4	4	4
Other[6]	(5)	(5)	(5)	2	1	1

[1] Based on US output evaluated in 1957-59 dollar prices and USSR output in 1963 ruble prices. Meat output is based on the live weight value of animals, including annual changes in the weight of herds. Components may not add to 100 percent due to rounding.
[2] Mutton, lamb, goat, and—in the USSR—miscellaneous meats such as horse, camel, reindeer, and game.
[3] Whole milk or butterfat equivalent; excludes milk sucked by calves.
[4] Clipped wool and mohair (and in the USSR camel hair and goat down); excludes pulled wool.
[5] Negligible.
[6] Honey and beeswax in US and honey and silk cocoons in USSR.

In the past two decades, meat has gained at the expense of milk in both US and Soviet livestock output. Comparing the structure of meat production in the two countries, beef and veal and poultry are relatively more important in the US than in the USSR. The decline in pork's share of US livestock production was more than offset by the increased share of beef and veal and poultry. In contrast, pork production very recently has approached beef and veal in value in the USSR. Because of the revolutionary changes in the broiler industry in the US—resulting in lower relative costs and higher quality—there has been a large gain in the consumption and production of poultry meat. The USSR is now embarked on a program to develop its own poultry sector along the intensive lines pioneered in the US.

SIZE COMPARISONS

The USSR's total livestock production increased from 45% of the US level in 1950–55 to 76% of the US level in 1966–70 (see Table 4).[13] During 1966–71, the USSR produced 57% as much meat and half as many eggs as the US but four times as much wool and half again as

NOTE.—See footnote 13, p. 352.

much milk. The net increase in Soviet gross livestock output between 1950–55 and 1966–71 (shown in the tabulation below) was more than $8½ billion, almost twice as much as the increment in US livestock production. The largest Soviet gains were in the production of milk, beef and veal, and pork. In the US, increased production of beef and veal and poultry meat accounted for ⅘ of the net gain in output of livestock products.

CHANGES IN ANNUAL AVERAGE LIVESTOCK PRODUCTION BETWEEN 1950–55 AND 1966–71

[Billion 1957–59 dollars]

Livestock products	United States	U.S.S.R.
Beef and veal	2.48	2.60
Pork	0.27	1.30
Other red meats	−0.05	0.19
Poultry meat	1.41	0.22
Milk	0.22	4.01
Eggs	0.44	0.65
Wool	−C.02	0.18
Other	(1)	(1)
Total	4.74	8.62

[1] Negligible.

TABLE 4.—US-USSR: COMPARISON OF ANNUAL AVERAGE OUTPUT OF LIVESTOCK PRODUCTS, SELECTED PERIODS, 1950–71

[Billion 1957–59 dollars]

Livestock product	United States[1]				U.S.S.R.[2]			
	1950–55	1956–60	1961–65	1966–71	1950–55	1956–60	1961–65	1966–71
Beef and veal	5.27	5.73	6.72	7.75	1.69	2.60	3.15	4.29
Pork	3.31	3.31	3.39	3.58	1.18	1.87	1.99	2.48
Other red meat	0.25	0.28	0.26	0.20	0.53	0.76	0.74	0.72
Poultry meat	0.99	1.44	1.87	2.41	0.17	0.27	0.32	0.39
Milk	4.71	4.98	5.15	4.92	3.44	5.26	5.95	7.45
Eggs	1.72	1.81	1.93	2.15	0.45	0.69	0.84	1.10
Wool	0.11	0.13	0.13	0.10	0.21	0.31	0.35	0.39
Other	0.05	0.05	0.05	0.04	0.11	0.10	0.11	0.11
Total livestock production	16.41	17.74	19.49	21.15	7.42	11.33	12.86	16.04

[1] Components of US output may not add to total output because of rounding while components of USSR output will not add to the totals due to the use of geometric mean comparisons for individual products.
[2] Calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.

Soviet progress in livestock production, although noteworthy, is less spectacular when viewed in perspective. In 1966–71, the average annual output of beef and veal, pork, poultry meat, and eggs in the USSR still had not reached the level achieved in the US in 1950–55. The comparisons, moreover, do not reflect some important advantages the US holds in terms of variety and quality of meat produced. In addition, a much larger portion of the milk produced in the USSR is used (whole or skim) to feed livestock.

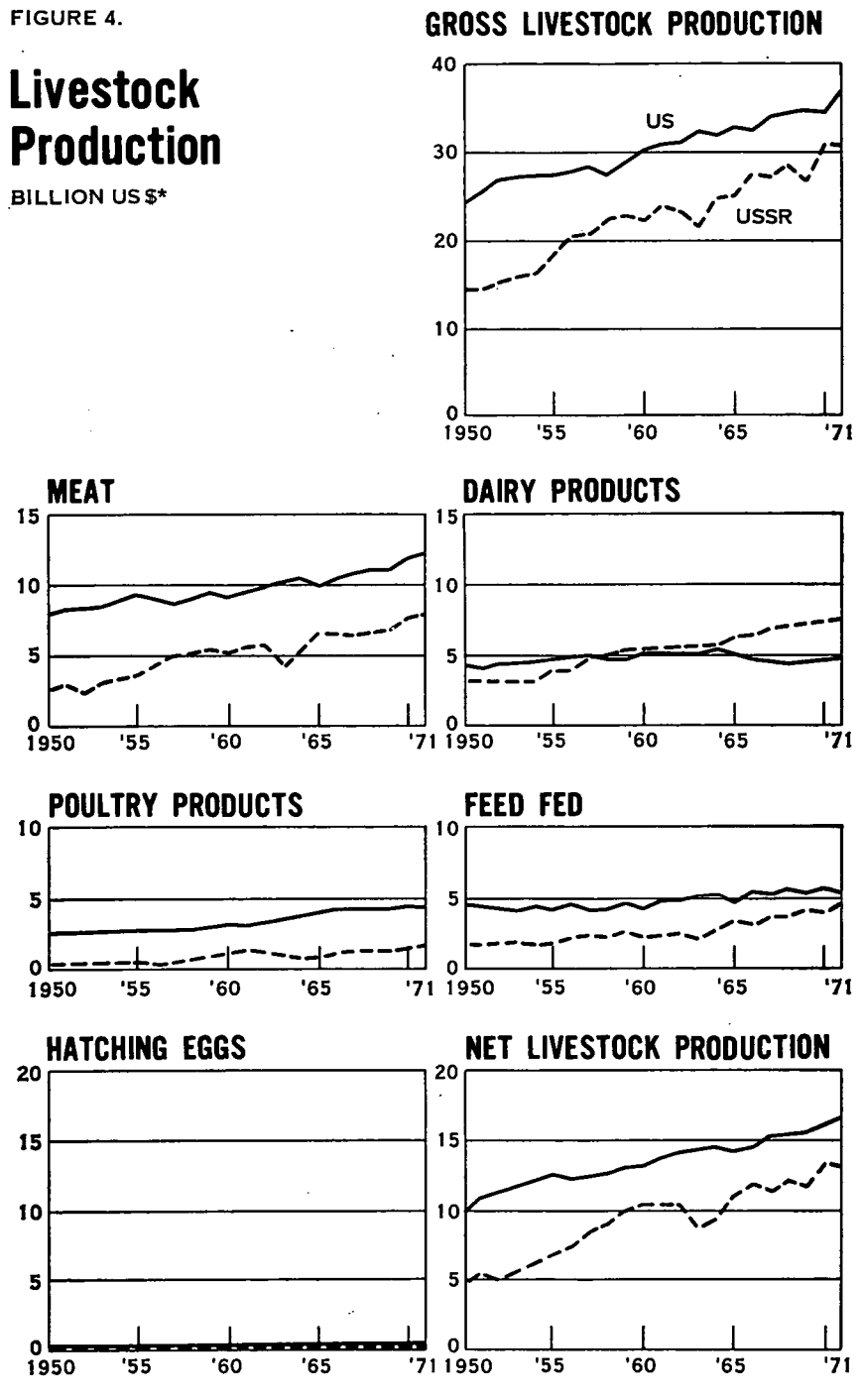
The rate of growth of USSR livestock output has been far from uniform since 1950 (see Figure 4). The reasonably rapid progress in Soviet livestock output during the early 1950's probably prompted

[13] These comparisons are of gross livestock production. As noted above, the value of grain, potatoes, sugar beets, and milk fed to livestock and hatching eggs are subtracted in converting gross livestock production to net livestock production. Because the US relies more heavily on grain as a livestock feed than does the USSR, Soviet livestock production is closer to US production on a net basis than it is on a gross basis. In 1950–55, Soviet net livestock was 49% of US production; in 1966–71, it was 78% of US production.

FIGURE 4.

Livestock Production

BILLION US $*



*USSR data calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.

Khrushchev's campaign to overtake the US in per capita production of milk by 1958 and in per capita production of meat by 1960 or 1961. Although these goals were not met, the increased attention which they brought to the livestock sector contributed heavily to the rise in Soviet livestock production from about 45% of US production in 1950–55 to about 64% in 1956–60. Relative gains in Soviet livestock production during the early 1960s were largely offset by setbacks in 1963 so the position of the USSR remained at about ⅔ of the US level. However, a decline in US meat and dairy production in 1965 sharply raised the Soviets relative standing to 74%. Since 1965, the USSR has gained very little on the US; Soviet livestock production, averaged 76% of US output in 1966–71.

IV. Relative Levels of Farm Technology

In terms of the technology employed in agriculture, the USSR lags far behind the US. No single index of the technological level of farm production can be definitive, but Table 5 presents a number of indicators that bear on the question. For example, productivity of labor is much higher in the US, the US uses mineral fertilizers much more intensively, and the ratio of farm equipment to cultivated acreage is far higher in the US. Despite the greater labor intensity of Soviet farming, the US advantage in terms of a higher proportion of land with fertile soil and adequate moisture taken together with an advantage in fertilizer application, varietal development, livestock breeding, and organization has resulted in a marked difference in crop and livestock yields. In sum, US agriculture is a mature, capital intensive sector of the economy, while in the USSR

TABLE 5.—US-USSR: INDICATORS OF THE LEVEL OF FARM TECHNOLOGY [1]

Indicator	United States	USSR	USSR as percent of United States
Share of labor force employed in agriculture (percent)	4	31	775
Output per farm worker	$7746	[2] $834	11
Number of persons supported by one farm worker	46	7	15
Sown acreage per tractor (acres)	64	258	403
Grain acreage harvested per combine (acres)	52	473	910
Trucks per 1,000 farm workers	665	34	5
Fertilizer nutrients applied to crops [3] (pounds/acre)	93	45	48
Of which:			
Nitrogen (N)	44	22	50
Phosphorous (P_2O_5)	26	11	42
Potash (K_2O)	23	12	52
Livestock yields:			
Average live weight at slaughter:			
Cattle (pounds)	953	[4] 681	71
Hogs (pounds)	240	[4] 236	98
Eggs per hen/year	218	[4] 166	76
Milk per cow milked/year (pounds)	9,388	[4] 4,652	50
Crop yields (bushels per acre):			
Spring wheat [5]	28	14	50
Winter wheat [5]	33	26	79
Rye [5]	26	16	62
Oats [5]	52	34	65
Corn [5]	69	35	51
Barley [5]	44	26	59
Potatoes	382	173	45
Sugar beets (metric tons/acre)	16	9	56
Ginned cotton (pounds/acre)	442	784	177

[1] Based on 1970 data, except as noted.
[2] Calculated from US output using the geometric mean of comparisons of USSR and US output carried out, alternatively, in dollar and ruble prices.
[3] Based on 1971 data.
[4] Average for state procured animals.
[5] 3 year average (1969/70/71).

the development of agriculture has lagged far behind the other sectors of the economy and remains today a highly labor intensive sector.

Despite the fact that during the past 20 years the USSR has consistently devoted a large share of all its fixed investment to agriculture—currently 18% compared to 4% in the US—the withdrawal of manpower from Soviet farms has been relatively slow (see Table 6).

TABLE 6.—US-USSR: COMPARISON OF FARM LABOR FORCE, 1950–71[1]

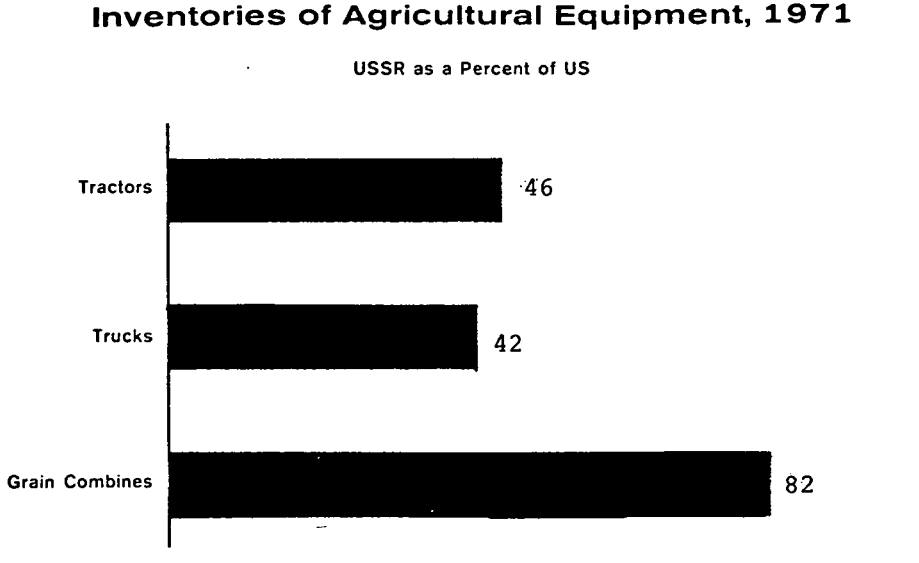
[Thousand persons]

	United States	USSR	Ratio of USSR to US labor force
1950	9,926	49,931	5.0
1955	8,379	51,166	6.1
1960	7,057	46,555	6.6
1961	6,919	45,136	6.5
1962	6,700	44,015	6.6
1963	6,518	42,890	6.6
1964	6,110	42,703	7.0
1965	5,610	42,338	7.5
1966	5,214	41,617	8.0
1967	4,903	40,654	8.3
1968	4,749	39,701	8.4
1969	4,596	38,473	8.4
1970	4,523	37,480	8.3
1971	4,446	36,852	8.3

[1] Sources and methodology for Table 6:
United States: 1950–71, Agriculture Statistics 1971, USDA, 1971, p. 523.
USSR: 1950 and 1955, Ritchie H. Reed, "Estimates and Projections of the Labor Force and Civilian Employment in the USSR: 1950–75, US Department of Commerce, 1967," p. 15. 1951–52, 1954, 1956—Interpolated; 1959–71, David. Bronson, "Soviet Manpower Prospects in the 1970s," Prospects for Soviet Economic Growth in the 1970s, Brussels, 1971 p. 141.

Most of the decline in farm labor in the USSR occurred in the 1960s as the cumulative weight of the investment program had its effect. Inventories of agricultural machinery and equipment have increased substantially since the 1950s, but Soviet farms still have many fewer tractors, trucks, and grain combines than US farms have (see Figure 5).

FIGURE 5



The overriding goal of agricultural planners in the USSR has been to provide agriculture with greater amounts of mechanical horsepower and the basic types of farm machinery. The same models have been turned out year after year. The development of specialized agricultural equipment has suffered especially. This does not necessarily mean that the USSR lacks the technology for the development of such machines. Rather, it reflects the preoccupation with correcting shortages of more basic types of machinery. In addition, the efficient use of Soviet mechanized equipment has been hampered by the poor state of repair work. Spare parts are in short supply, high priced, and often of poor quality.

Grain production is completely mechanized in the USSR, but only 80 percent of the Soviet Union's potato crop and sugar beet crop and about one-third of the cotton crop are harvested mechanically. Specialized machines such as carrot harvesters, tea pickers, and grape pickers have been used at least experimentally in the USSR, but the level of mechanization in vegetable and fruit growing remains low. Mechanization of Soviet livestock production is probably less than in crop production. Only about 5% of the poultry in the USSR is raised in fully-mechanized operations, and almost 60% of the milking in the socialized sector is still done manually.

Soviet leaders have become increasingly aware of the need to modernize the USSR's farm sector and now place the highest priority on assimilating the newest technology, especially in the areas of livestock breeding and feed grain production. In this context, the Soviet leadership is aware of the US's leading role in farm technology and is interested in benefitting from US experience through technical exchanges and acquisition of US methods and equipment.

The Soviet Union has made definite progress in supplying chemical fertilizer to the agricultural sector. The total availability of fertilizer, for example, increased more than 9 times between 1950 and 1971 compared to a 3-fold increase in the US. Until recently cotton and other technical crops were the main consumers of fertilizer in the USSR. Now, however, fertilizer use is shifting in favor of grain crops, as shown in the following tabulation.

PERCENT OF TOTAL FERTILIZER CONSUMED

	Grains	Cotton	Other
1960	16	22	62
1968	30	10	60
1970	36	(1)	(1)

[1] Not available.

V. Outlook for the Mid-1970s

Soviet prospects for catching up with US farm output by 1975 are poor. The continuation in 1971 of a sharp fall in Soviet crops and a record harvest in the US put the gap in crop production below the 1966 level. An even worse harvest in 1972 eroded the Soviet position further. Although Soviet leaders are counting on substantial gains in 1973–75 to bring production back in line with the original 1971–75 plan goals, the actual gains are very unlikely to bring the USSR's farm output up to 1970 US output by 1975.

The 1971–75 plan goals for the production of meat, eggs, and cotton could be achieved, but the increase in targets for production of milk, grain, sugar beets, and sunflower seeds, are probably beyond reach (See Table 7). In order to produce an average of 195 million (gross) tons of grain in 1971–75, for example, the USSR would have to get an average crop of 211 million tons in 1973–75—43 million tons more than the 1972 crop. Even if achieved, this would not yield enough net usable grain [14] to come up to the US level of 1970.

TABLE 7.—USSR: PROGRESS IN MEETING 1971-75 PLAN GOALS FOR AGRICULTURE [1]

(In million metric tons)

	Goals for average production in 1971–75	Average actual production in 1971–72 [2]	Average production needed in 1973–75 to meet 1971–75 goals
Grain	195.0	171.0	211.0
Potatoes	(3)	85.1	(3)
Vegetables	(3)	20.0	(3)
Cotton	7.0–7.2	7.2	6.9–7.2
Sugar beets	87.5	73.9	96.6
Sunflower seeds	6.7	5.5	7.5
Meat	14.3	13.5	14.8
Milk	92.3	83.2	98.4
Eggs [4]	46.7	46.7	46.7
Wool	.464	.422	.492

[1] Official production data are presented in this table to permit a comparison of actual production with plan goals. In the case of grain and sunflower seeds the gross production overstates significantly the net usable output—by an average of about 8 percent for sunflower seeds and 19 percent for grain.
[2] Based on preliminary estimates of 1972 production and actual production in 1971.
[3] Not available.
[4] Billion eggs.

More important, the USSR surely will face increasing difficulties in 1973–75 in meeting requirements for grain from domestic resources if the leadership holds to its commitment to strengthen the livestock sector. As indicated above, the expansion of livestock herds and increased feed rations per animal, coupled with continued inefficiency in converting feed to live weight, have raised Soviet requirements for feed substantially.[15] At the same time yields of forage crops have virtually stagnated, placing the burden of supporting the livestock program on feed grains. The USSR, however, will not be able to grow the corn and soybeans which are the basis of US rations. Thus, Brezhnev's livestock program, if it is maintained, will become increasingly costly, in part because of a continuing need to buy foreign grain.

Many other factors will influence farm production in both the US and the USSR—political developments as well as economic constraints. Unusual developments in export demand, for example, could result in more rapid growth of US output, using land now held out of production to meet output needs. In the USSR, on the other hand, the further expansion of farm output depends largely on resources and technology still untested under Soviet conditions and on policies not fully formulated. Continued Soviet purchases of US feed grains no doubt will stimulate both USSR output of livestock products and

[14] Soviet net usable grain in 1971-75 would average 158 million tons annually compared to an annual average of 195 million tons in the US during 1966-70.
[15] The quantity of grain used for food has remained the same over the past decade, but the use of grain as livestock feed increased 40% between 1968 and 1971.

US output of feed grains. The uncertainty surrounding future grain purchases notwithstanding, an extension of recent trends in US and USSR farm outputs suggests that Soviet production might increase to only about 85–88% of US output by 1975.

Appendix A

The Meaning and Assessment of Comparisons of US and USSR Agriculture

A comparison of any two economies must come to grips with the problem of valuing two different assortments of output in a common set of prices. The international currency exchange rate cannot be used for the US and USSR, because the exchange rate is set arbitrarily, foreign trade is a tightly controlled monopoly in the USSR, and the exchange rate reflects imperfectly only the prices of goods and services that are traded internationally and therefore is not representative of the full range of agricultural output.

The comparisons of US and Soviet agriculture in this paper rely on a quite different procedure. First US agricultural output in dollars is converted to rubles by appropriate ratios of Soviet to US prices for various farm commodities (see App. Table C–3). This procedure yields a comparison of US and Soviet agricultural output in ruble prices. Then, Soviet farm output in rubles is converted to dollars by the ratios of US to Soviet prices, permitting a comparison of farm production in the two countries in dollar prices.

The relative values of agriculture and its major components in the US and in the USSR thus differ somewhat, depending on whether the comparisons are stated in terms of US prices or Soviet prices (see App. Table A–1). The explanation lies in the difference in the pattern of output and prices in the US and the USSR, which reflects differences in tastes, levels of income, natural resources, technology, and state of development. Previous international economic comparisons, including those for the US and the USSR, have found that the ratio of prices of goods between two countries tends to be inversely related to the ratio of quantities produced. In other words, goods that are produced in relatively large quantities in either country tend to sell at relatively low prices in that country, and vice versa.

TABLE A-1.—COMPARISON OF US AND USSR FARM OUTPUT (USSR AS PERCENT OF US)

	Total net farm output			Crop production			Net livestock production		
	Dollar comparison	Ruble comparison	Geometric mean	Dollar comparison	Ruble comparison	Geometric mean	Dollar comparison	Ruble comparison	Geometric mean
1950	65	57	61	77	66	72	47	46	47
1951	58	52	55	64	56	60	49	48	49
1952	60	53	57	72	61	66	44	44	44
1953	62	56	59	72	60	66	48	52	50
1954	65	58	61	76	63	69	52	52	52
1955	70	63	67	84	69	76	54	56	55
1956	79	70	74	95	78	86	59	60	59
1957	81	73	77	94	76	84	67	70	69
1958	82	73	77	91	74	82	70	72	71
1959	78	69	73	81	65	73	73	75	74
1960	77	69	73	79	64	71	74	76	75
1961	82	74	78	87	70	78	77	78	77
1962	80	71	76	84	66	75	76	78	77
1963	70	61	65	77	60	68	62	62	62
1964	85	74	79	102	80	90	65	66	66
1965	82	73	77	86	68	77	76	79	77
1966	93	79	85	106	78	91	78	79	78
1967	88	74	80	98	73	85	75	75	75
1968	91	77	84	101	78	89	79	77	78
1969	85	73	79	92	69	80	76	78	77
1970	97	82	89	109	81	94	82	84	83
1971	87	75	81	96	70	82	77	82	79

As a result of the inverse relation between prices and output in the US and USSR, the agricultural output of the USSR is much larger relative to that of the US when the comparison is made in dollar prices. This is because dollar

prices place greater weight on commodities in which the USSR specializes. For example, wheat accounts for about 55% of Soviet grain production but only 26% of US grain output. Because wheat has a relatively high dollar/ruble ratio compared with other grains, Soviet total grain production relative to the US is much larger in dollars than in rubles. Conversely, valuations made in ruble prices place greater weight on commodities with high ruble/dollar ratios such as citrus fruits, which comprise a larger share of total production in the United States than in the USSR.

Since ruble-valued comparisons generally are biased in favor of the US and dollar-valued comparisons generally are biased in favor of the USSR, some ambiguities can occur with respect to the relative positions of the two countries. For example, tomatoes and cabbage have very high dollar/ruble ratios and together comprise more than 60% of Soviet vegetable production but only 18% of US production. Thus, vegetable production in the USSR during 1966–71 appears greater than in the US when the comparison is made in dollars, but less than in the US when the comparison is made in rubles (see App. Table A–2). Strictly speaking, neither comparison really measures the difference in total farm output of the two countries, because no unambiguous comparison of output is possible, except in the unlikely cases that relative prices are the same in each country or both countries are producing an exactly proportional mix of agricultural commodities. Instead a comparison of US and Soviet agriculture measured in dollar prices implies that the US could shift to the Soviet pattern of production and still produce the same dollar value of output as before. On this assumption, the comparison in dollar prices is an approximate measure of the relative ability of the two countries to produce the Soviet mix of output. The comparison of agriculture in ruble prices is a measure of their relative ability to produce the US mix of output. The quantitative results—that the comparison in dollars is more favorable to the USSR and the comparison in rubles is more favorable to the United States—reflect the fact that each country is better equipped to produce its own pattern of output than that of the other country.

TABLE A-2.—US-USSR: COMPARISONS OF MAJOR AGRICULTURAL PRODUCTS (USSR AS PERCENT OF US)

	Dollar comparison				Ruble comparison			
	1950–55	1956–60	1961–65	1966–71	1950–55	1956–60	1961–65	1966–71
Feed grains	32	29	43	42	23	21	26	25
Food grains	156	190	158	175	170	198	161	172
Vegetables	56	80	94	108	39	57	68	80
Potatoes	715	774	669	682	715	774	669	682
Fruits, berries, and nuts	22	31	42	58	13	19	27	35
Sugar crops	142	238	223	265	142	238	223	265
Cotton and cottonseed	41	51	50	97	41	51	50	97
Tobacco	11	16	16	27	11	16	16	27
Oil crops	52	52	53	46	22	20	21	18
Total crops	74	88	87	100	63	71	69	75
Meat	37	54	54	64	38	57	58	65
Dairy products	73	106	116	151	73	106	116	151
Poultry products	22	28	29	31	24	30	32	34
Other	193	235	263	358	196	239	267	363
Less:								
Feed fed	39	56	59	84	32	44	44	58
Hatching eggs	30	29	26	25	31	29	26	25
Net livestock production	49	69	71	78	50	70	72	79
Total farm output	63	80	80	91	57	71	71	77

The geometric mean of the dollar and ruble comparisons provides a single measure of relative size and, arguably, a better measure than either the dollar or ruble comparison. The dollar comparison implies that relative costs of producing the various kinds of output would not change if the US tried to transfer resources so as to produce the Soviet mix. Similarly, the ruble comparison implicity assumes that the USSR could shift to the production of the US output mix with no change in unit costs or prices. Neither outcome is likely; each country would have to give up increasingly large amounts of output in exchange for more output characteristics of the other country's production mix. On the other hand, the geometric mean of the dollar and ruble comparisons of farm output in the two countries is an approximate measure of their relative ability

to produce a mix of output that lies between the actual mixes in the two countries. Looked at in this way, the geometric mean provides a measure of the production capabilities of the two countries that is perhaps less biased than either of the comparisons in national prices.

Intertemporal comparisons of agricultural output within each country also differ depending on whether the comparison is made in rubles or dollars. If farm commodities with relatively high ruble/dollar ratios (and therefore relatively more weight in the ruble index) grow more rapidly than commodities with high dollar/ruble ratios, the index will increase more when valued in rubles than in dollars. For example, during 1951–71 feed grains increased more rapidly in the US than in the USSR when the comparison is made in rubles while the reverse is true when the comparison is made in dollars. This is because corn, which has a relatively high ruble/dollar ratio, increased more rapidly than the other major feed grains in the US. Thus, the ruble value of US feed grains rose faster than the dollar value. Conversely in the USSR, the fastest growing feed grain was barley, which has a relatively heavier weight in dollars than rubles. All other major categories of agricultural output except oil crops and potatoes grew faster in the USSR than in the US, whether valued in dollars or in rubles.

A particularly troublesome problem for international comparisons is how to account for qualitative differences that exist between similar products in each country. In the case of US and USSR farm products the most significant differences in quality occur among fruits, vegetables, and meat. In the USSR, for example, the highest quality fruits are scarcely comparable to average quality fruits in the US. US livestock raising techniques generally result in higher quality beef cattle in terms of quantity of meat on the bone than are raised in the USSR. Pork production in the US is oriented toward lean meat while in the USSR a greater proportion of fat is present in pork output.

Some of these differences in quality can be taken into account by using relatively higher Soviet prices (e.g., the price assigned to the highest quality products) to derive the ruble/dollar conversion ratios. This results in higher ruble/dollar ratios than would obtain using average Soviet prices, and, in turn, proportionately higher ruble values of US output and lower dollar values of Soviet output. Accordingly, adjustments were made for 1971 and the results, together with their impact on the comparisons of total farm output in the US and USSR, are shown in the tabulation below.

USSR AS PERCENT OF US, 1971

	Unadjusted for quality differences			Adjusted for quality differences		
	Rubles	Dollars	GM [1]	Rubles	Dollars	GM [1]
Fruits	38	64	49	31	51	40
Vegetables	86	117	100	69	117	90
Total crops	70	96	82	66	94	79
Meat animals	69	65	67	55	52	53
Gross livestock output	76	80	78	66	73	69
Net livestock output	82	77	79	68	67	67
Total farm output	75	87	81	67	82	74

[1] Geometric mean of size comparisons calculated alternatively in ruble and dollar prices.

In this hypothetical adjustment Soviet prices for fruit were increased by 25%, the ratio of state purchase prices for first quality produce to state purchase prices for lower quality fruit. The quality adjustment for vegetables is a special case. Because the bulk of Soviet vegetable production consists of six products [16] which in quality are the equal of their US counterparts, it was not necessary to deflate the dollar value of USSR vegetable production. In the US, however, vegetable production consists of a much wider assortment of products, so the ruble value of US output was inflated by increasing the ruble/dollar ratio by 25%—the ratio of Soviet state purchase prices for first quality produce to state purchase prices for lower quality. The quality of meat produced in the USSR in general seems equivalent to US utility grade. Thus to adjust for the large quality difference between the two countries, the dollar value of Soviet meat output was deflated (and the US ruble value inflated) by applying a ruble/dollar ratio which reflects US utility grade prices in 1957–59.

The quality adjustment for fruits and vegetables results in a relatively minor adjustment in the comparisons of total crop production. The quality adjustment

[16] Tomatoes, cabbage, onions, cucumbers, beets, and carrots.

for meat, however, has a decided impact on livestock output. Thus, total farm output in the USSR is reduced from about ⅘ to ¾ of the US level. Since any adjustment for quality differences must be quite arbitrary, however, the difference between the adjusted and unadjusted data might be considered a range within which the true relationship between US and Soviet farm production lies.[17]

Appendix B

Methodology and Data Used in Comparing US and USSR Agriculture

The comparisons of agricultural production in the US and USSR presented in this paper show the relative levels and year to year changes in total farm output and its major components during 1950–71. Starting with USDA estimates of American farm output, valued in 1957–59 dollars, values of Soviet farm output were derived which attempt to match as closely as possible the coverage and methodology used in the USDA estimates.[18]

Definition of Farm Output

Farm output in each country includes all crops produced during the year except hay and pasture, hayseeds, pasture seeds, and covercrop seeds.[19] Farm output also includes the net production of livestock other than draft animals. Net livestock production is gross production of livestock minus the value of products (grain, potatoes, sugar beets, and milk) fed to livestock. Hatching eggs also are excluded in calculating net livestock production. These calculations are made to avoid counting feed crops in the production of both livestock and crops and to avoid counting hatching eggs as part of poultry meat production as well as egg production.

In calculating farm output, gross livestock production is divided into two components: (1) value added including hay and pasture consumed and (2) feed other than hay and pasture. Since hay and pasture is not included in crop production, it is included with value added in the livestock sector.[20] In US statistics the total value of feed other than hay and pasture is calculated as a constant proportion of gross production of each kind of livestock. For the USSR, however, the value of feed fed to livestock is estimated for each type of feed crop other than hay and pasture (i.e., grain, potatoes, sugar beets, and milk).

Comparability of Data

The data on US farm output are based on statistics compiled by the US Department of Agriculture for constructing indexes of agricultural production. The weights used in the US value series are average 1957–59 dollar prices. The data on USSR farm output are based on Soviet official production statistics, adjusted when necessary to make them comparable with the US data. The weights used in the USSR ruble values are 1968 average realized prices.

The most significant adjustment to the Soviet official production data occurs in the grain statistics. Official USSR grain production statistics are accepted for all years prior to 1956. Soviet data for 1956, 1958, and subsequent years, however, exaggerate actual grain output because of the definitional basis on which output is measured. Since 1957 the USSR has been reporting grain production on

[17] It should be emphasized that neither the Soviet production statistics used in this paper nor the quality adjustments described above make any allowance for losses incurred after the products leave the farm gate. For some products—notably fruits, vegetables, and potatoes—a substantial difference exists between what leaves Soviet farms and what actually reaches the consumers. In fact, various Soviet authors have indicated that losses of such products due to spoilage in transit or inadequate storage facilities amount to at least 10%—and in some cases as much as 20-25%—of state purchases. See, for example, N. S. Rolik, "O Sovershenstvovanii Planirovaniya Ispol'zovaniya Kartofelya, Ovoshchey, Fruktov, i Vinograda," in N. A. Letov (ed), *Organizatsiya i Planirovanie Otrasley Narodnogo Khozyaystva*, 1969, pp. 127-134, and *Sovetskaya Torgovlya*, No. 6, 1968, pp. 14-21. In addition, because of deficiencies in the marketing system, a substantial portion of fruits and vegetables are fed to livestock.

[18] The data and methodology on US farm output are described in USDA Statistical Bulletin #233, *Changes in Farm Production and Efficiency*, which is published annually by the Economic Research Service.

[19] Conceptually, no crop grown for farm seed purposes should be included in farm output. Because of the lack of necessary data for the US, however, no deductions were made for other types of seeds (e.g., grain and potatoes) in either country.

[20] US statistics usually report hay and harvested roughage (e.g., corn silage, sorghum silage, sorghum forage) with crop production rather than livestock output. To make the US and USSR data on crop production comparable, however, these data were subtracted from US crop production and added to US net livestock production.

a "bunker weight" basis—defined as the gross output of grain obtained from the harvesting machine in the field. Because the bunker weight measure includes excess moisture, unripe and damaged kernels, weed seeds, and the losses occuring in loading, unloading, and transporting grain between the combine in the field and the storage facilities, net usable output of grain in the USSR has been derived for all years after 1957.

Soviet production statistics for sunflower seeds have been adjusted in a like manner. Official data are used for the years 1950–57; for years after 1957, official production data are reduced by 8% to allow for the excess moisture and trash that results when the "bunker weight" concept is used to determine the size of the harvest. Soviet official production data are accepted for all other components of farm output.

While the overall comparisons of total farm output in the US and USSR probably are free of any significant conceptual bias, some caution is warranted in comparing individual subcategories of farm output. Soviet statistics on milk production, for example, may distort somewhat the relative position of USSR dairy products because the Soviets must estimate a large share of their milk output without the benefit of checking marketing accounts. Only a limited portion of milk produced in the USSR is marketed (the rest remains on the farms to feed rural households or animals), so the bulk of milk production must be estimated from surveys. Moreover, much of the Soviet data on milk marketings is actually a calculated milk equivalent of marketed cream. Thus, any understatement of the milk equivalent conversion factor for cream results in overstatement of total milk marketed and, in turn, total milk output.[21] Despite these shortcomings, no adjustments are made to the Soviet data on milk production in this paper, since any adjustment would add only an arbitrary calculation to an already imprecise measure.[22]

The inclusion of seed grain and seed potatoes in the value series of agricultural production overstates somewhat the value of crop production and total farm output in the two countries. This overstatement is greater in the case of USSR production because of lower yields of grain and potatoes together with higher Soviet seeding rates. Despite the larger bias in the Soviet data the effect of excluding seed grain and seed potatoes on the growth of total farm output is relatively slight (see App. Table B–1).

TABLE B–1.—USSR: COMPARISON OF TOTAL FARM OUTPUT INCLUDING AND EXCLUDING SEED

	U.S.S.R.: Total farm output (million 1968 rubles)		Index (1968=100)	
	Including seed grain and seed potatoes [1]	Excluding seed grain and seed potatoes	Including seed grain and seed potatoes	Excluding seed grain and seed potatoes
1950	36,065	32,366	51.7	49.3
1951	34,057	30,296	48.8	46.2
1952	35,764	32,103	51.2	48.9
1953	37,586	33,835	53.9	51.6
1954	39,045	35,109	55.9	53.5
1955	44,096	39,971	63.2	60.9
1956	49,159	44,848	70.4	68.4
1957	50,561	46,222	72.4	70.5
1958	54,263	49,994	77.7	76.2
1959	53,355	49,227	76.4	75.1
1960	53,793	49,672	77.1	75.7
1961	57,835	53,720	82.9	81.9
1962	56,553	52,336	81.0	79.8
1963	50,047	45,650	71.7	69.6
1964	59,580	55,185	85.4	84.1
1965	61,519	57,130	88.1	87.1
1966	66,815	62,525	95.7	95.3
1967	66,393	62,131	95.1	94.7
1968	69,794	65,585	100.0	100.0
1969	67,426	63,126	96.6	96.3
1970	75,875	71,732	108.7	109.4
1971	75,892	71,821	108.7	109.5

[1] From Table C–2.

[21] For example, one pound of butterfat is equivalent to 25 pounds of milk averaging 4% butterfat but 29 pounds of milk averaging 3.5% butterfat.

[22] It should also be noted that Soviet milk production includes milk other than cows' milk. Although such milk may have comprised as much as 6% of total milk output in the early 1950's, its share declined to about 2% in 1959 and is probably negligible today.

Soviet Price Weights and Ruble-Dollar Conversion Ratios

The choice of appropriate price weights for valuing agricultural commodities produced in the USSR presents a number of problems, especially when the resulting values must be used in international comparisons. This is because prices in the USSR are essentially an accounting device and need not reflect accurately either planning preferences or the real costs (scarcity values) of farm commodities. The USSR carried out a series of price revisions in 1965, however, with the aim of creating a schedule of farm prices that better reflect relative costs than earlier prices. A variety of prices exists for most commodities depending on such factors as the type of market, quality, location, and season when the commodity is marketed, but the Soviets have been reluctant to publish average prices received by all farms throughout the USSR for individual commodities. The price weights used in this paper are therefore estimates of 1968 average realized prices received by state and collective farms and private producers for their marketed output. For each commodity the average realized price is derived by weighting by the share sold the actual 1968 price obtained by agricultural producers in each of three "trade channels"; (1) procurements by the state (which include procurements from state farms and other state agricultural enterprises, collective farms, and private plots of peasants. workers and employees); (2) collective farm market (ex-village) and commission trade; and (3) decentralized procurements. For some categories of farm output—notably fruits and vegetables—average realized prices cannot be derived because sufficient price data for individual commodities are not available. In these cases state procurement prices, appropriately weighted, are used.

The price weights used to value Soviet meat output are a special case. Because the data on Soviet meat production in tons are reported in terms of slaughter-weight while the value of US meat production reflects the live weight of the animals, prices were derived for the USSR which implicity include the whole animal in the resulting value series of Soviet meat production. This makes total meat output in the USSR more comparable with US data and permits the use of a ruble/dollar conversion ratio based on live weight prices to derive the dollar value of USSR meat production.

A sample of the US and USSR commodity prices used in this paper together with the ruble/dollar conversion ratios are shown in App. Table C-3.

Derivation of US and USSR Labor Force Data

The US farm labor force data shown in Table 6 includes the average number of persons employed during one survey week each month. This includes farm operators doing one or more hours of farm work and members of their families working 15 hours or more during the survey week without cash wages as well as hired workers doing farm work during the survey week for pay.

The Soviet farm labor force data includes all persons employed on state farms, collective farms and in private farm activity. In general, labor force estimates were derived by applying the relationship between the labor force reported in a population census to reported employment data. For the years 1950 and 1955 the relationship was assumed to be constant at the 1959 level. In 1960–71 the more complex methodology described below had to be used.

Data from both the 1959 and 1970 population censuses are used in conjunction with other official data. Data reported for 1959 show that the civilian labor force in non-agricultural sectors, state farms, and collective farms was 17% greater than employment in these sectors. A like measure for 1970, indicated that employment data were inflated by 5%. It is assumed that this "inflator" decreased by an equal amount—1%—each year. Multiplying the yearly employment data for 1960–71 by the inflator computer for each year yields the yearly labor force employed in non-agricultural sectors. state farms, and collective farms. Further, the 1959 data show that the share of the absolute difference between labor force and employment was 46% for the non-agricultural sectors and state farms and 54% for the collective farms. Assuming that this relationship was constant, the labor force in these two sectors was derived for 1960–71.

Estimates of the total labor force in the private sector for 1960–71 were derived by applying the relationship reported in the 1959 census between private workers and the labor force on state and collective farms (25.8%) to the subsequent yearly estimates of the labor forces on state and collective farms.

APPENDIX C

SELECTED STATISTICAL TABLES ON US AND USSR AGRICULTURE

TABLE C–1.—US-USSR: DOLLAR VALUE OF AGRICULTURAL OUTPUT BY MAJOR COMPONENT, 1950–71

[In million 1957–59 dollars]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Crops:											
Feed grains:											
U.S.S.R.	1, 495	1, 035	1, 504	1, 194	1, 208	1, 758	1, 687	1, 354	1, 69)	1, 260	1, 586
United States	4, 335	4, 024	4, 278	4, 171	4, 366	4, 650	4, 608	5, 019	5, 477	5, 703	5, 904
Food grains:											
U.S.S.R.	2, 882	3, 010	3, 615	3, 394	3, 515	3, 893	4, 613	4, 502	5, 121	4, 255	3, 684
United States	2, 047	2, 025	2, 602	2, 387	2, 108	1, 985	2, 070	1, 956	2, 877	2, 300	2, 738
Vegetables:											
U.S.S.R.	810	739	877	1, 001	1, 052	1, 251	1, 272	1, 324	1, 338	1, 336	1, 506
United States	1, 730	1, 728	1, 694	1, 718	1, 669	1, 703	1, 768	1, 686	1, 687	1, 683	1, 683
Potatoes:											
U.S.S.R.	3, 558	2, 359	2, 778	2, 914	3, 012	2, 881	3, 856	3, 526	3, 475	3, 476	3, 388
United States	470	355	384	416	400	417	452	444	483	446	468
Fruits, berries, and nuts:											
U.S.S.R.	263	274	285	296	324	353	317	456	447	457	456
United States	1, 365	1, 409	1, 362	1, 387	1, 375	1, 378	1, 432	1, 310	1, 422	1, 455	1, 366
Sugar crops:											
U.S.S.R.	261	296	279	291	249	390	·408	498	683	551	724
United States	231	184	190	209	231	211	212	241	236	260	252
Cotton and cottonseed:											
U.S.S.R.	936	985	999	1, 019	1, 110	1, 026	1, 145	1, 113	1, 147	1, 228	1, 134
United States	1, 763	2, 667	2, 665	2, 898	2, 411	2, 600	2, 357	1, 932	2, 019	2, 568	2, 517
Tobacco:											
U.S.S.R.	125	132	140	148	159	160	166	177	182	183	170
United States	1, 179	1, 355	1, 317	1, 196	1, 304	1, 278	1, 266	968	1, 008	1, 044	1, 131
Oil crops:											
U.S.S.R.	378	367	452	532	379	744	776	557	833	547	702
United States	946	862	849	830	923	1, 036	1, 227	1, 208	1, 477	1, 308	1, 389
Miscellaneous crops:											
U.S.S.R.	231	207	221	·204	237	340	408	365	389	355	408
United States	64	64	64	56	51	57	52	56	66	62	56
Total crops:											
U.S.S.R.	10, 939	9, 404	11, 150	10, 993	·11, 245	12, 796	14, 648	13, 872	15, 311	13, 648	13, 758
United States	14, 130	14, 673	15, 405	15, 268	14, 838	15, 315	15, 444	14, 820	16, 752	16, 829	17, 504

Livestock products:											
Meat animals:											
U.S.S.R.	2,830	3,026	2,721	3,306	3,665	3,931	4,287	4,909	4,980	5,537	5,253
United States	8,081	8,650	8,778	8,825	9,128	9,556	9,278	8,938	9,115	9,785	9,530
Dairy products:											
U.S.S.R.	3,249	3,330	3,285	3,355	3,514	3,956	4,518	5,037	5,398	5,680	5,678
United States	4,610	4,540	4,561	4,779	4,847	4,900	4,996	5,005	4,964	4,936	5,003
Poultry products:											
U.S.S.R.	444	534	566	656	677	706	744	863	892	1,014	1,082
United States	2,570	2,659	2,682	2,720	2,832	2,804	3,063	3,115	3,285	3,405	3,388
Miscellaneous livestock products:											
U.S.S.R.	263	277	308	327	322	346	353	387	413	448	449
United States	151	160	164	155	157	169	163	167	173	182	184
Gross livestock production:											
U.S.S.R.	6,786	7,167	6,880	7,644	8,178	8,939	9,902	11,196	11,683	12,679	12,462
United States	15,412	16,009	16,185	16,479	16,964	17,429	17,500	17,225	17,537	18,308	18,105
Less feed fed:											
U.S.S.R.	1,725	1,606	1,820	1,927	1,849	2,030	2,467	2,671	2,676	2,939	2,519
United States	4,712	4,724	4,697	4,572	4,719	4,715	4,828	4,488	4,574	4,982	4,664
Less hatching eggs:											
U.S.S.R.	13	18	18	23	20	20	21	25	27	32	32
United States	53	60	60	64	63	66	81	84	97	102	104
Net livestock production:											
U.S.S.R.	5,048	5,543	5,042	5,694	6,309	6,889	7,414	8,500	8,980	9,708	9,911
United States	10,647	11,225	11,428	11,843	12,182	12,648	12,591	12,653	12,866	13,224	13,339
Total farm output:											
U.S.S.R.	15,987	14,947	16,192	16,687	17,554	19,685	22,062	22,372	24,291	23,356	23,661
United States	24,777	25,898	26,833	27,111	27,020	27,963	28,035	27,473	29,618	30,053	30,849

TABLE C–1.—US-USSR: DOLLAR VALUE OF AGRICULTURAL OUTPUT BY MAJOR COMPONENT, 1950–71—Continued

[In million 1957–59 dollars]

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Crops:											
Feed grains:											
U.S.S.R.	2,010	2,311	2,358	3,021	2,095	2,525	2,491	2,578	2,939	3,046	2,890
United States	5,326	5,375	5,833	5,109	5,978	5,950	6,700	6,386	6,603	5,998	7,767
Food grains:											
U.S.S.R.	4,311	4,238	3,284	4,397	3,907	5,988	4,792	5,442	4,619	5,879	5,955
United States	2,509	2,327	2,435	2,699	2,773	2,798	3,200	3,367	3,105	2,914	3,423
Vegetables:											
U.S.S.R.	1,515	1,496	1,438	1,881	1,669	1,731	1,991	1,869	1,808	1,999	1,962
United States	1,731	1,733	1,715	1,663	1,705	1,694	1,750	1,823	1,792	1,722	1,726
Potatoes:											
U.S.S.R.	3,385	2,798	2,885	3,760	3,561	3,528	3,833	4,103	3,685	3,886	3,720
United States	531	481	491	440	523	551	550	531	560	583	564
Fruits, berries, and nuts:											
U.S.S.R.	466	552	592	634	747	720	828	980	873	1,079	1,136
United States	1,429	1,436	1,397	1,407	1,481	1,510	1,563	1,452	1,768	1,673	1,787
Sugar crops:											
U.S.S.R.	639	595	553	1,019	907	929	1,093	1,184	893	983	906
United States	282	291	375	381	339	338	337	391	404	401	408
Cotton and cottonseed:											
U.S.S.R.	1,194	1,137	1,377	1,397	1,496	1,581	1,578	1,571	1,509	1,821	1,877
United States	2,518	2,621	2,709	2,687	2,638	1,685	1,308	1,929	1,768	1,795	1,856
Tobacco:											
U.S.S.R.	147	149	174	259	240	249	294	301	273	310	306
United States	1,199	1,348	1,364	1,294	1,078	1,096	1,148	995	1,050	1,111	994
Oil crops:											
U.S.S.R.	856	878	783	1,082	979	1,120	1,192	1,204	1,131	1,111	1,029
United States	1,610	1,621	1,702	1,703	2,042	2,177	2,267	2,549	2,616	2,646	2,718
Miscellaneous crops:											
U.S.S.R.	391	428	415	394	473	505	514	462	526	536	561
United States	59	59	58	57	67	67	64	60	64	62	63
Total crops:											
U.S.S.R.	14,914	14,582	13,859	17,844	16,074	18,876	18,606	19,694	18,256	20,650	20,342
United States	17,194	17,292	18,079	17,440	18,624	17,866	18,887	19,483	19,730	18,905	21,306

Livestock products:											
Meat animals:											
U.S.S.R.	5,808	5,928	4,401	5,338	6,695	6,689	6,991	7,124	7,077	8,022	8,120
United States	9,909	10,089	10,605	10,899	10,324	10,733	11,170	11,339	11,375	12,092	12,497
Dairy products:											
U.S.S.R.	5,756	5,882	5,635	5,820	6,676	6,991	7,353	7,571	7,502	7,638	7,653
United States	5,133	5,163	5,130	5,202	5,118	4,964	4,931	4,883	4,862	4,909	4,976
Poultry products:											
U.S.S.R.	1,153	1,179	1,126	1,001	1,103	1,197	1,271	1,341	1,402	1,581	1,755
United States	3,661	3,654	3,753	3,896	4,041	4,300	4,496	4,417	4,553	4,760	4,829
Miscellaneous livestock products:											
U.S.S.R.	473	462	470	436	445	473	491	508	473	513	522
United States	185	179	176	167	163	157	148	138	143	131	123
Gross livestock production:											
U.S.S.R.	13,190	13,451	11,632	12,595	14,919	15,350	16,106	16,544	16,454	17,754	18,050
United States	18,888	19,085	19,664	20,164	19,646	20,154	20,745	20,777	20,933	21,892	22,425
Less feed fed:											
U.S.S.R.	2,587	2,796	2,603	2,990	3,809	3,767	4,452	4,330	4,550	4,394	5,089
United States	4,970	4,932	5,121	5,248	4,874	5,092	5,098	5,213	5,228	5,580	5,464
Less hatching eggs:											
U.S.S.R.	35	33	38	24	29	31	32	36	41	54	58
United States	117	118	125	129	138	154	157	158	171	181	183
Net livestock production:											
U.S.S.R.	10,568	10,622	8,991	9,581	11,081	11,552	11,622	12,178	11,863	13,306	12,903
United States	13,801	14,035	14,418	14,787	14,634	14,908	15,490	15,406	15,534	16,131	16,778
Total farm output:											
U.S.S.R.	25,482	25,204	22,850	27,425	27,155	30,428	30,228	31,872	30,119	33,956	33,245
United States	30,995	31,327	32,497	32,227	33,258	32,774	34,377	34,889	35,264	35,036	38,084

TABLE C-2.—US-USSR: RUBLE VALUE OF AGRICULTURAL OUTPUT BY MAJOR COMPONENT, 1950–71

[In million 1968 rubles]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Crops:											
Feed grains:											
U.S.S.R.	2,852	2,333	2,870	2,279	2,336	3,742	3,528	2,595	3,472	2,378	3,062
United States	11,984	11,231	12,224	11,876	11,966	12,760	12,964	13,552	14,872	15,940	16,411
Food grains:											
U.S.S.R.	5,565	5,765	6,560	6,092	6,352	7,054	7,967	7,794	8,682	7,267	6,347
United States	3,424	3,428	4,322	4,021	3,663	3,355	3,454	3,230	4,650	3,825	4,488
Vegetables:											
U.S.S.R.	1,055	971	1,157	1,335	1,416	1,695	1,739	1,823	1,858	1,872	2,130
United States	3,385	3,295	3,254	3,348	3,239	3,288	3,385	3,280	3,268	3,277	3,252
Potatoes:											
U.S.S.R.	9,216	6,110	7,196	7,547	7,802	7,462	9,986	9,133	8,999	9,002	8,775
United States	1,218	920	995	1,078	1,035	1,081	1,170	1,149	1,252	1,156	1,212
Fruits, berries, and nuts:											
U.S.S.R.	784	816	849	882	965	1,053	946	1,360	1,333	1,362	1,359
United States	6,647	6,624	6,622	6,781	6,842	6,852	7,066	6,266	7,136	7,075	6,645
Sugar crops:											
U.S.S.R.	666	756	711	742	634	994	1,040	1,270	1,741	1,406	1,847
United States	590	469	483	533	590	537	541	615	602	662	641
Cotton and cottonseed:											
U.S.S.R.	1,600	1,685	1,709	1,742	1,898	1,754	1,958	1,903	1,962	2,100	1,939
United States	3,014	4,560	4,557	4,956	4,123	4,446	4,030	3,303	3,453	4,392	4,304
Tobacco:											
U.S.S.R.	158	167	176	187	200	202	209	223	229	230	214
United States	1,486	1,707	1,659	1,507	1,643	1,611	1,595	1,220	1,270	1,316	1,425
Oil crops:											
U.S.S.R.	555	532	625	731	503	976	1,009	739	1,089	728	905
United States	2,982	2,741	2,741	2,630	2,992	3,349	3,985	4,020	4,890	4,377	4,618
Miscellaneous crops:											
U.S.S.R.	658	527	575	470	598	978	1,285	1,104	1,123	963	1,118
United States	96	98	101	81	81	79	84	83	99	100	93
Total crops:											
U.S.S.R.	23,109	19,662	22,428	22,007	22,704	25,910	29,667	27,944	30,488	27,308	27,696
United States	34,826	35,073	36,958	36,811	36,174	37,358	38,274	36,718	41,492	42,120	43,089

Livestock products:											
Meat animals:											
U.S.S.R.	8,560	9,111	8,414	10,340	10,602	11,945	13,108	14,997	15,228	16,909	15,917
United States	23,852	25,542	25,482	24,912	25,916	27,388	26,447	25,499	26,118	28,236	27,170
Dairy products:											
U.S.S.R.	5,685	5,828	5,748	5,872	6,150	6,923	7,907	8,815	9,447	9,940	9,937
United States	8,068	7,945	7,982	8,363	8,483	8,575	8,743	8,753	8,687	8,638	8,755
Poultry products:											
U.S.S.R.	1,571	1,928	2,032	2,380	2,431	2,511	2,642	3,083	3,184	3,646	3,881
United States	8,661	8,949	8,964	9,107	9,443	9,300	10,150	10,270	10,880	11,244	11,155
Miscellaneous livestock products:											
U.S.S.R.	1,077	1,138	1,258	1,335	1,317	1,409	1,442	1,573	1,681	1,820	1,825
United States	605	643	660	623	628	677	655	671	695	730	738
Gross livestock production:											
U.S.S.R.	16,893	18,005	17,452	19,927	20,500	22,788	25,099	28,468	29,540	32,315	31,560
United States	41,186	43,079	43,088	43,005	44,470	45,940	45,995	45,193	46,380	48,848	47,818
Less feed fed:											
U.S.S.R.	3,895	3,552	4,057	4,273	4,094	4,538	5,541	5,771	5,680	6,166	5,362
United States	12,810	12,975	12,845	12,647	12,984	13,130	13,252	12,672	12,869	13,660	13,088
Less hatching eggs.:											
U.S.S.R.	42	58	59	75	65	64	66	80	85	102	101
United States	171	193	193	206	203	213	258	270	311	325	332
Net Livestock Production:											
U.S.S.R.	12,956	14,395	13,336	15,579	16,341	18,186	19,492	22,617	23,775	26,047	26,097
United States	28,205	29,911	30,050	30,152	31,283	32,597	32,485	32,251	33,200	34,863	34,398
Total farm output:											
U.S.S.R.	36,065	34,057	35,764	37,586	39,045	44,096	49,159	50,561	54,263	53,355	53,793
United States	63,031	64,984	67,008	66,963	67,457	69,955	70,759	68,969	74,692	76,983	77,487

TABLE C-2.—US-USSR: RUBLE VALUE OF AGRICULTURAL OUTPUT BY MAJOR COMPONENT, 1950-71—Continued

[In million 1968 rubles]

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Crops:											
Feed grains:											
U.S.S.R.	4,004	4,028	3,800	4,809	3,386	4,167	4,211	4,290	5,017	5,143	4,882
United States	14,925	15,014	16,422	14,362	16,790	16,721	19,068	17,930	18,606	16,800	22,080
Food grains:											
U.S.S.R.	7,456	7,308	5,649	7,441	6,866	9,966	8,175	9,377	7,941	9,853	10,022
United States	4,141	3,911	4,203	4,628	4,755	4,839	5,483	5,823	5,349	5,024	5,824
Vegetables:											
U.S.S.R.	2,111	2,115	1,929	2,536	2,348	2,478	2,682	2,580	2,543	2,911	2,859
United States	3,281	3,287	3,281	3,169	3,273	3,216	3,288	3,427	3,465	3,328	3,307
Potatoes:											
U.S.S.R.	8,768	7,246	7,471	9,739	9,222	9,137	9,928	10,627	9,545	10,065	9,636
United States	1,374	1,245	1,271	1,140	1,354	1,427	1,425	1,376	1,451	1,510	1,462
Fruits, berries, and nuts:											
U.S.S.R.	1,389	1,644	1,763	1,888	2,227	2,146	2,466	2,921	2,603	3,215	3,384
United States	6,627	7,059	6,246	6,246	6,907	7,318	8,037	6,923	8,713	8,314	8,831
Sugar crops:											
U.S.S.R.	1,629	1,518	1,410	2,598	2,313	2,369	2,788	3,019	2,277	2,506	2,310
United States	720	743	956	968	864	861	860	997	1,031	1,023	1,039
Cotton and cottonseed:											
U.S.S.R.	2,042	1,945	2,355	2,389	2,559	2,703	2,698	2,687	2,580	3,114	3,210
United States	4,306	4,482	4,633	4,595	4,511	2,881	2,236	3,298	3,024	3,070	3,174
Tobacco:											
U.S.S.R.	186	187	219	327	303	314	370	379	343	390	385
United States	1,511	1,699	1,718	1,631	1,359	1,381	1,447	1,254	1,323	1,399	1,252
Oil crops:											
U.S.S.R.	1,144	1,196	1,065	1,406	1,279	1,504	1,606	1,628	1,476	1,507	1,406
United States	5,432	5,428	5,701	5,716	6,848	7,365	7,689	8,653	8,861	8,942	9,226
Miscellaneous crops:											
U.S.S.R.	1,057	1,148	1,046	967	1,274	1,270	1,320	1,127	1,335	1,290	1,363
United States	94	94	94	97	105	113	121	110	117	122	116
Total crops:											
U.S.S.R.	29,786	28,335	26,707	34,100	31,777	36,054	36,244	38,635	35,660	39,994	39,457
United States	42,411	42,962	44,525	42,552	46,766	46,122	49,654	49,791	51,940	49,532	56,311

Livestock products:											
Meat animals:											
U.S.S.R.	17,704	18,002	12,910	16,024	20,185	19,708	19,238	19,601	20,845	23,932	24,242
United States	28,300	28,751	30,181	30,756	28,874	30,128	31,521	32,019	31,978	34,065	35,258
Dairy products:											
U.S.S.R.	10,073	10,293	9,861	10,185	11,683	12,235	12,867	13,249	13,128	13,366	13,392
United States	8,982	9,035	8,978	9,102	8,956	8,687	8,629	8,546	8,509	8,591	8,708
Poultry products:											
U.S.S.R.	4,134	4,222	4,041	3,537	3,912	4,241	4,485	4,740	4,965	5,646	6,274
United States	12,029	12,038	12,361	12,816	13,291	14,165	14,761	14,548	15,612	15,697	15,915
Miscellaneous livestock products:											
U.S.S.R.	1,920	1,876	1,915	1,782	1,813	1,926	1,999	2,065	1,924	2,079	2,123
United States	742	719	708	670	654	632	594	555	575	525	492
Gross livestock production:											
U.S.S.R.	33,831	34,393	28,727	31,528	37,593	38,110	38,589	39,655	40,862	45,023	46,031
United States	50,053	50,543	52,228	53,344	51,775	53,612	55,505	55,668	56,074	58,878	60,373
Less feed fed:											
U.S.S.R.	5,671	6,068	5,266	5,970	7,758	7,251	8,336	8,381	8,966	8,968	9,412
United States	13,766	13,774	14,147	14,520	13,790	14,243	14,624	14,650	14,644	15,427	15,101
Less hatching eggs:											
U.S.S.R.	111	107	121	78	93	98	104	115	130	174	184
United States	375	378	399	412	442	492	502	507	547	580	585
Net livestock production:											
U.S.S.R.	28,049	28,218	23,340	25,480	29,742	30,761	30,149	31,159	31,766	35,881	36,435
United States	35,912	36,391	37,682	38,412	37,543	38,877	40,379	40,511	40,883	42,871	44,687
Total farm output:											
U.S.S.R.	57,835	56,553	50,047	59,580	61,519	66,815	66,393	69,794	67,426	75,875	75,892
United States	78,323	79,353	82,207	80,964	84,309	84,999	90,033	90,302	92,823	92,403	100,998

TABLE C-3.—SAMPLE OF COMMODITY PRICES IN THE UNITED STATES AND U.S.S.R., AND RUBLE-DOLLAR CONVERSION RATIOS

	Per Metric ton			Average ruble dollar conversion ratio	
	1957–59 dollar price	1968 ruble price	Ruble dollar conversion ratio	U.S.[1] weights	U.S.S.R.[2] weights
Feed crops				2.84	1.69
Corn for grain	$42.91	136	3.17		
Oats	42.03	80	1.90		
Barley	40.42	77	1.90		
Grain sorghum	37.01	57	1.54		
Hay	21.08	27	1.28		
Millet	45.13	85	1.88		
Pulses	150.72	113	0.75		
Other	31.79	57	1.79		
Food grains				1.70	1.68
All wheat	66.14	102	1.54		
Rye	40.94	109	2.66		
Buckwheat	48.23	287	5.95		
Rice	105.38	291	2.76		
Vegetables				1.91	[3] 1.46
Green lima beans	199.74	332	1.66		
Snap beans	194.00	332	1.71		
Beets	68.78	91	1.32		
Broccoli	169.09	60	0.35		
Brussels sprouts	166.89	106	0.64		
Cabbage	47.62	45	0.94		
Carrots	63.71	121	1.90		
Cauliflower	141.09	302	2.14		
Celery	84.66	302	3.57		
Sweet corn	81.13	151	1.86		
Cucumbers	111.99	181	1.62		
Eggplant	115.96	302	2.60		
Garlic	213.63	1,284	6.01		
Onions	61.73	348	5.64		
Green peas	203.70	302	1.48		
Green peppers	198.85	302	1.52		
Shallots	140.21	121	0.86		
Tomatoes	156.09	136	0.87		
Honeydew melons	114.20	121	1.06		
Watermelon	32.41	76	2.34		
Potatoes	40.12	104	2.59		
Fruits, berries, and nuts				4.94	2.98
Apples	72.31	300	4.15		
Apricots	131.34	310	2.36		
Cherries	231.15	195	0.84		
Grapes	68.14	300	4.40		
Peaches	91.27	385	4.22		
Pears	79.40	425	5.35		
Persimmons	90.61	195	2.15		
Fresh plums and prunes	139.89	230	1.64		
Pomegranates	96.01	280	2.92		
Mandarins	58.26	600	10.30		
Oranges	77.40	600	7.75		
Strawberries	352.74	600	1.70		
Sugar crops				2.55	2.55
Sugar beets	12.54	32	2.55		
Sugarcane (for sugar and seed)	7.89	----	(2.55)		
Sugarcane sirup	223.35	----	(2.55)		
Sorghum sirup	439.01	----	(2.55)		
Maple sirup	911.42	----	(2.55)		
Cotton	776.15	1,329	1.71	1.71	1.71
Tobacco				1.26	1.26
Tobacco	1,280.87	1,610	1.26		
Makhorka	----	610	(1.26)		
Oil crops				3.39	1.37
Sunflower seeds	184.75	221	1.20		
Soybeans for beans	73.85	260	3.52		
Flax seed	111.80	245	2.19		
Mustard seed	136.91	250	1.83		
Caster beans	102.95	800	7.77		
Miscellaneous crops				1.84	2.43
Fiber flax	566.76	2,268	4.00		
Cowpeas	151.75	95	0.63		
Broomcorn	277.91	57	0.21		
Popcorn	54.45	52	0.96		
Tea	1,023.24	940	0.92		

See footnoes at end of table.

TABLE C-3.—SAMPLE OF COMMODITY PRICES IN THE UNITED STATES AND U.S.S.R., AND RUBLE-DOLLAR CONVERSION RATIOS—Continued

	Per Metric ton			Average ruble dollar conversion ratio	
	1957–59 dollar price	1968 ruble price	Ruble dollar conversion ratio	U.S.[1] weights	U.S.S.R.[2] weights
Meat animals (live weight)				2.82	2.99
Beef	$449.30	1,113	2.48		
Veal	515.44	1,113	2.16		
Sheep	147.71	715	4.84		
Lambs	436.73	715	1.64		
Hogs	375.66	1,388	3.69		
Dairy products				1.75	1.75
Butterfat	1,324.96		(1.75)		
Milk, wholesale	91.93	161	1.75		
Milk, retail	218.41		(1.75)		
Milk, consumed on farm	98.33		(1.75)		
Poultry products				3.30	3.57
Eggs	[4] 29.36	94	3.20		
Commercial broilers	390.21	1,357	3.48		
Chickens	286.60	1,357	4.73		
Turkeys	524.69	1,357	2.59		
Miscellaneous livestock products				4.00	4.07
Honey	390.21	1,600	4.10		
Beeswax	1,082.46	5,000	4.62		
Wool, clipped	976.64	3,873	3.97		
Silk, cocoons	640.57	3,600	5.62		

[1] Based on the pattern of U.S. production in 1971.
[2] Based on the pattern of U.S.S.R. production in 1971.
[3] Based on the pattern of production for 6 vegatables, (tomatoes, cabbage, onions, cucumbers, carrots, and beets).
[4] Per/000.

TABLE C-4.—US-USSR: COMPARISON OF LIVESTOCK HERDS, JAN. 1, 1950–72

[In millions of heads]

Year	All cattle		Cows		Hogs		Sheep and goats	
	United States	U.S.S.R.[1]	United States[2]	U.S.S.R.	United States	U.S.S.R.	United States[3]	U.S.S.R
1950	78.0	58.1	40.6	24.6	58.9	22.2	32.4	93.6
1951	82.1	57.1	42.1	24.3	62.3	24.4	33.1	99.0
1952	88.1	58.8	43.9	24.9	62.1	27.1	34.3	107.6
1953	94.2	56.6	46.8	24.3	51.8	28.5	34.3	109.9
1954	96.7	55.8	48.9	25.2	45.1	33.3	34.0	115.5
1955	96.6	56.9	49.1	26.4	50.5	30.9	34.6	113.0
1956	95.9	58.8	48.3	27.7	55.4	34.0	34.3	116.2
1957	92.9	61.4	46.9	29.0	51.9	40.8	33.9	119.8
1958	91.2	66.8	45.4	31.4	51.5	44.3	34.6	130.1
1959	93.3	70.8	45.2	33.3	58.0	48.7	36.4	139.2
1960	96.2	74.2	45.9	33.9	59.0	53.4	37.1	144.0
1961	97.7	75.8	46.5	34.8	55.6	58.7	36.7	140.3
1962	100.4	82.1	47.5	36.3	56.6	66.7	35.2	144.5
1963	104.5	87.0	48.6	38.0	58.0	70.0	33.5	146.4
1964	107.9	85.4	49.9	38.3	56.8	40.9	31.7	139.6
1965	109.0	87.2	50.4	38.8	50.8	52.8	29.9	130.7
1966	108.9	93.4	49.2	40.1	47.4	59.6	29.4	135.3
1967	108.6	97.1	49.9	41.2	53.2	58.0	28.0	141.0
1968	109.2	97.2	50.0	41.6	55.3	50.9	26.1	144.0
1969	109.9	95.7	50.4	41.2	57.0	49.0	24.5	146.1
1970	112.5	95.2	51.3	40.5	53.3	56.1	23.2	135.8
1971	114.6	99.2	[4] 52.3	41.0	[5] 63.5	67.5	[6] 22.4	143.4
1972	117.9	102.4	[4] 54.5	41.2	[5] 60.9	71.4	[6] 21.1	145.3

[1] Includes buffalo and yak.
[2] Includes heifers 2 years old and over that have not calved; during 1965–70, these averaged 4.2 percent, of cows and heifers that had calved.
[3] Sheep and lambs plus number of goats clipped for mohair.
[4] Estimated on basis of cows and heifers calved.
[5] Estimated on the basis of annual changes in December numbers.
[6] Estimated on the basis of sheep and lambs.

TABLE C-5.—US-USSR: PRODUCTION OF SELECTED COMPONENTS OF FARM OUTPUT

	United States			U.S.S.R.		
	1950	1960	1971	1950	1960	1971
	Million metric tons					
Corn	70	99	140	7	7	7
Oats	20	17	13	13	9	12
Barley	7	9	10	6	12	28
Other [1]	6	16	23	5	4	8
Total feed grains	103.0	141.0	186	31.0	32.0	55
Wheat	28	37	45	31	48	81
Rye	0.5	0.8	1	18	12	10
Buckwheat	0.1	(2)		1	0.5	1
Rice	2	2	4	0.2	0.1	1
Total food grains	30.6	39.8	50	50.2	60.6	93
	Thousand metric tons					
Potatoes	11,720	11,660	14,340	88,612	84,374	92,655
Vegetables	13,793	16,690	19,260	9,344	16,574	20,838
Fruits, berries, and nuts	12,965	15,914	20,752	2,850	4,942	12,307
Sugar beets	12,279	14,897	24,380	20,819	57,723	72,185
Cotton and cottonseed	5,904	8,447	6,130	3,539	4,289	7,101
Tobacco and makhorka	921	882	775	157	178	254
Soybeans for beans	8,146	15,109	31,830	166	220	618
Sunflower seeds				1,798	3,650	5,210
Livestock products:						
Beef and veal	9,610	13,062	18,400	2,355	3,252	5,500
Pork	9,170	8,710	10,394.5	1,478	3,376	5,300
Mutton and kid	606	739	471	690	1,019	1,000
Poultry meat	2,301	3,923	6,486	278	766	1,200
Eggs (thousand pieces)	58,954	61,462	71,427	11,697	27,464	45,100
Milk	35,446	48,022	51,553	35,311	61,718	83,183
Wool	104	131	79	180	357	429

[1] Grain sorghum for the United States; millet and pulses for the U.S.S.R.
[2] Negligible.

Part V. CONSUMPTION

SOVIET CONSUMER WELFARE: THE BREZHNEV ERA

By DAVID W. BRONSON *and* BARBARA S. SEVERIN

CONTENTS

I. INTRODUCTION

Under Brezhnev's leadership, the average level of living in the U.S.S.R. has risen yearly by amounts that most Westerners would consider exceptional. Diets have improved—more meat and other quality food and fewer starches are on the nation's tables. Consumer durables are found in more homes and are more available in stores.

Russian dress has improved, and the contrast with foreign clothing is less discernible. Still, the consumer's situation is a mixture of pluses and minuses. On the negative side, incomes have continued to rise faster than the supply of goods and services, perhaps forcing individuals to postpone purchases. Despite marked improvement in the level of living over the mid-1960's, the gap between the U.S.S.R. and the West—or even Bloc countries—remains large. Moreover, those problems that most vexed consumers earlier, remain—such as inadequate supplies and quality of various foods, housing, and services. Finally, the harvest disaster in 1972 and subsequent shortages and higher prices remind consumers how tentative their gains have been. The Soviet regime has not yet satisfactorily solved that most basic of problems—providing the population with a quality diet.

In an earlier article for this committee we reported on trends in consumer welfare between 1950 and 1965, largely basing our analysis on independently constructed indexes of consumption and disposable money income.[1] These measures are brought up to date in this article, and trends in consumer welfare since 1965 are discussed in some detail. Finally, this article examines the consumer program contained in the current 1971–75 plan.

II. Consumer Welfare Under Brezhnev

During the first eight years of Brezhnev's rule (1965–72) the broad-based indicators of the level of living—per capita consumption and per capita real disposable money income—grew more rapidly than during the nine-year Khrushchev era (1956–64), (see Table 1). The rate of growth in incomes during both periods exceeded that of consumption by about 2 percentage points.[2] Under both Khrushchev and Brezhnev, the two welfare indicators grew much faster during the early years of their rule than during the latter years. The higher rates during the earlier years of both periods may reflect efforts by these leaders to consolidate their positions by currying favor with consumers. This is suggested most dramatically by the tripling of the rate of growth of consumption between Khrushchev's last 3 years and Brezhnev's first 3 years in power.

[1] David W. Bronson and Barbara S. Severin, "Recent Trends in Consumption and Disposable Money Income in the USSR," in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II–B, Washington, D.C., 1966, p. 495–529.

[2] Differences in the composition of the consumption and income measures account for much of the difference in their growth rates. The measure of personal consumption includes consumption of both home-produced and state-supplied goods and services as well as purchased goods and services. The income measure includes not only money spent but savings. Adjusting the two series to make them as nearly compatible as possible raises the rate of growth of consumption and lowers that of income slightly;

	1956–64		1965–72	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Per capita consumption	3.1	4.8	5.0	5.8
Per capita real disposable money income	5.2	5.2	6.9	6.6

The adjusted series were derived by 1) reducing the value of total personal consumption by a) the value of state-supplied services, primarily health and education; b) the value of rent imputed to private housing; and c) the value of home-produced and consumed food; and 2) eliminating savings from the incomes measure.

TABLE 1.—U.S.S.R.: TRENDS IN CONSUMER WELFARE UNDER KHRUSHCHEV AND BREZHNEV[1]

[Average annual rates of growth in percent]

	Khrushchev Period			Brezhnev Period		
	1956–64	1956–58	1962–64	1965–72	1965–67	1970–72
Per capita consumption	3.1	4.3	2.0	5.0	6.2	4.1
Per capita real disposable money income	5.2	7.3	2.2	6.9	8.9	5.4

[1] Source: All rates derived from data in Appendixes B and C of this section, except income data for 1958 and 1961 which are from Bronson and Severin, op. cit. p. 526.

Incomes

Since 1965, per capita real disposable money income has grown at an average annual rate of 6.2 percent. This represents a pickup in the rate of growth from the 5.7 percent annual rate recorded during 1961–65, but falls short of the 8.2 percent achieved on average during the 1950s. As in earlier periods, the rate of improvement in the official measure of per capita real income since 1965 has fluctuated sharply—from a high of 11.4 percent in 1965 to a low of 3.8 percent in 1969. On balance, however, the growth rate has tended to decline since 1965; it averaged 8.9 percent during 1965–67 compared with 5.4 percent during 1970–72.

The exceptionally high rate recorded during 1965–67 resulted primarily from the implementation of a number of welfare measures. In 1965, the new Brezhnev regime, making haste to identify itself with the Soviet war on poverty, ordered a speedup in carrying out Khrushchev's last announced welfare program. That program (1) provided wage increases averaging 21 percent for 18 million of the 22 million workers in the services sector of the economy; (2) raised the minimum wage rate of urban workers by more than one-third and of rural workers by about one-half; (3) boosted by more than one-third the minimum pensions of disabled workers and the minimum benefits of survivors; and (4) placed the 24 million to 30 million collective farmers and their families under a new statewide social insurance system similar to the existing one for wage and salary workers.[3] A similar, though less extensive program was carried out in 1968 when wage rates were raised substantially for 15 million machine tool workers, the general minimum wage was raised by 50 percent (from 40 to 60 rubles a month) and longevity payments for workers in remote areas were reintroduced.[4]

About three-fourths of disposable money income originates in the gross earnings of wage and salary workers employed at state enterprises. These earnings and the wage payments made to collective farmers, the other major employment category in the U.S.S.R., rose by roughly two-thirds between 1965 and 1972. About two-thirds of the rise in earnings of wage and salary workers was accounted for by additional workers, about one-third represented higher wage and salary rates. In contrast, all the gains by collective farmers came about through higher average earnings. Indeed, a 14 percent decline in the number of collective farmers occurred during the period.

[3] *Pravda*, 14 July 1964.
[4] *Pravda*, 27 September 1967.

Transfer payments—mostly pensions and welfare grants—led the advance after 1964 among the major income categories. Three factors account for the increase. First, since pension and welfare grant payments are tied to workers' earnings, the higher pay rates have boosted pensions and welfare grants. Second, the rates by which pensions and welfare grants are calculated have been liberalized. For example, beginning in 1965, minimum levels of disability and survivor pensions were raised by an average of 35 percent.[5] Third, wider coverage—particularly bringing collective farmers under a state social insurance program in 1965—has escalated transfer payments and provided an example of the tendency of Soviet welfare programs to exceed planned costs. As originally conceived, the social insurance program for collective farmers was to be financed largely out of farm revenues, although a state subsidy averaging 400 million rubles during 1965–67 was envisaged.[6] Thereafter the program was to be supported completely by farm revenues. Subsequently the program's provisions were liberalized, however, raising the annual cost from 1.3–1.4 billion rubles in 1965 to about 5 billion rubles in 1971.[7] State subsidies, instead of being cut off as planned, rose to 1.7 billion rubles in 1971.[8]

The level of per capita disposable income in current prices has risen by over one half since 1965, from about 500 rubles to approximately 775 rubles. About 620 rubles a year are needed to provide an individual with a level of living designated by Soviet authorities as an acceptable minimum for "material well-being."[9] Thus, despite very rapid growth in incomes since 1950, it was not until 1968 that incomes reached what is considered a minimum acceptable level. Even in 1972, the average monthly wage of Soviet workers (130.3 rubles) was less than two-thirds that necessary to maintain a family of 4 at the minimum standards. This explains, in part, the high participation of women in the labor force and the low birth rate. The relative hand-to-mouth existence of the Soviet population is reflected in the level of personal savings, which, as a share of disposable income is about half the level in the U.S. Moreover, because consumer credit is virtually nonexistent in the U.S.S.R., a consumer hoping to buy, for example, one of the new Zhiguli automobiles costing about 5500 rubles needs to have the entire purchase price.

Compared with the U.S., where a post-World War II trend is difficult to detect,[10] the narrowing of wage differentials in the U.S.S.R. over the past two decades has been enormous. The economic consequences of the Soviet shift are not clear, however. Surely, low income groups live much better relative to those earning high incomes now than in 1950. The effect of smaller differentials on incentives and the allocation of labor among occupations and among sectors of the economy is not discernible. Soviet editorials are divided: some warn of the dangers of wage leveling,[11] but others treat the development as a sign of progress toward Communism.

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[5] *Vedomosti verkhovnogo soveta SSSR*, No. 1, 1965, pp. 4–6.
[6] *Sotsial'noye obespecheniye*, No. 12, 1964, p. 2.
[7] *Pravda*, 14 July 1964.
[8] Tsentral'noye statisticheskoye upravleniya. *Narodnoye khozyaystvo SSSR 1922–1972*, Moscow, 1972, p. 481. (Hereafter referred to as *N. Kh. 1922–1972*, or for other years in the series of official Soviet statistical yearbooks).
[9] L. E. Kunel'skiy, *Sotsial'no-ekonomicheskiye problemy zarabotnoy platy*, Moscow, 1972, p. 63.
[10] Sanford Rose, "The Truth About Income Inequality in the U.S.," *Fortune*, December 1972.
[11] E.g., *Pravda*, 4 April 1962.

TABLE 2.—U.S.S.R.: PERSONAL DISPOSABLE MONEY INCOME, 1965–72 [1]

[In billions of rubles]

	1965	1966	1967	1968	1969	1970	1971	1972 [2]	1972 as a percent of 1965
Total money income to the population	124.40	135.12	145.87	160.24	169.90	183.02	194.60	206.50	166.0
Gross earnings of wage and salary workers	89.07	95.85	103.37	115.09	123.34	132.03	140.20	148.87	167.1
Collective farm wage payments	9.10	10.90	12.60	13.16	12.97	13.52	14.08	14.74	162.0
Transfer payments [3]	15.70	17.13	18.36	20.28	22.36	24.39	26.86	27.12	172.7
Other earnings [4]	10.53	11.24	11.54	11.71	11.23	13.08	13.46	15.75	149.8
Total state deductions [5]	8.05	8.84	9.65	10.98	12.15	13.39	14.18	15.08	187.3
Total disposable money income	116.35	126.28	136.22	149.26	157.75	169.63	180.42	191.78	164.5
Consumer price index (1950=100)	77.8	76.9	76.9	77.0	77.7	78.1	77.7	78.2	100.5
Per capita real disposable money income (rubles)	647.7	703.3	750.6	813.5	843.9	894.5	947.4	989.0	152.7

[1] See Appendix B for sources and methodology.
[2] Preliminary estimate.
[3] Transfer payments include pensions and grants, stipends to students, loan service, insurance payments less premiums, and net borrowing.
[4] Other earnings include net household incomes from sale of farm products, profits distributed to cooperative members and military pay and allowances.
[5] Total state deductions include direct taxes on the population, local taxes, fees and fines, and state loans.

Raising the minimum wage in several steps from 22 rubles a month in 1950 to 60 rubles in 1968 was the key element in narrowing the wage differential between the low and high skilled segments of the labor force. Increases in the minimum wage raised the pay of both the lowest-paid workers and middle-income workers, as central authorities made adjustments in their pay rates in order to maintain desired differentials among jobs. Nevertheless, the increases have not been commensurate; the higher up the earnings scale, the smaller the increase has been the general rule. In scientific research institutes, for example, the basic wage rates of the lowest-paid workers have doubled or tripled since the mid-1950's while the rates of the highest-paid workers have remained unchanged.

Farmers have benefitted most from narrowing income differentials. Even after allowance is made for income in-kind that is not contained in the money income data,[12] the income going to farm families in 1950 was very low. Farmers earned only about one-sixth of all money incomes although they comprised over one-half of the civilian labor force and, together with their families, embraced more than three-fifths of the total population.[13] About 40 percent of the total cash incomes of farmers came from the sale of farm products, the remainder, equal to less than 3 rubles a month for the 35 million collective farmers, was derived from work in the socialized sector.

Between 1950 and 1971 the average wage grew faster in agriculture than in any other sector of the economy—rising 2.7 times on state farms and by even more on collective farms. In terms of total money incomes, gains in average farm wages have been largely offset by losses in the agricultural labor force.

[12] To the degree that payments in-kind are later sold for money, they are included in the money incomes of farmers.
[13] U.S. Bureau of the Census, *Estimates and Projections of the Labor Force and Civilian Employment in the USSR: 1950 to 1975*, by Ritchie H. Reed, International Population Reports, Series P–91, No. 15, Washington, D.C., 1967, p. 15.

Income gains by farmers resulted from several factors: pay rates have been raised substantially, millions of low paid collective farmers have been converted to higher paying state farm status, the occupational structure in farming has shifted so that a greater share of workers are in higher paying jobs such as machinery operators, and, to a lesser extent, farmers have increased sales of privately-owned farm products.[14]

Savings and Inflation

The rise in incomes has been associated with a rapid accumulation of personal savings; total deposits of the population in savings banks have grown 32-fold since 1950, or at an average annual rate of over 17 percent. This phenomenal growth together with the inability of the U.S.S.R. to meet consumer demand has been of concern to the leadership. As early as 1961, Khrushchev spoke of the "dangerous consequences" facing the Soviet economy as a result of inflationary pressures.[15] The riots in Poland in December 1970 over increases in the prices of selected consumer goods, and the current difficulties encountered by Brezhnev's own program to raise meat consumption have fueled the speculation as to the consequences of the continual build-up of savings in the U.S.S.R. in the face of unsatisfied consumer demand.

At best, the measurement of inflationary pressures in the U.S.S.R. is difficult because of the lack of comprehensive official data. Because retail prices are fixed in contrast to prices in the collective farm market (CFM), which are relatively free to respond to supply and demand,[16] the ratio between prices in the CFM and state stores is the best available statistical measure of the state's failure to absorb excess purchasing power. Although the ratio has been rising in recent years it is still well below the 1955 level (see Table 3). Furthermore, the ratios prevailing in recent years are far below the 2.2 ratio in 1940. The diminishing importance of the CFM in total retail trade, however, has limited the usefulnes of this indicator of inflationary pressure. In 1971, food purchases in actual prices paid accounted for only 4 percent of total food purchases. If those purchases had been made at state store prices, the share would have been 2.6 percent.[17] Lacking surveys or other indications of consumer reaction, it is not possible to gauge consumer discontent. Moreover, idle funds in the face of shortages are only one variable in the equation. Consumers also must be influenced by the rate of progress they feel they have made to date and by their judgment as to the consequence of any overt expression of discontent.

TABLE 3.—U.S.S.R.: RATIO OF CFM PRICES TO STATE RETAIL PRICES FOR FOOD 1955, 1960, 1965–72

1955	1.75	1968	1.43
1960	1.35	1969	1.54
1965	1.47	1970	1.61
1966	1.41	1971	1.58
1967	1.43	1972	[1]1.63

[1] Estimated.

[14] For a detailed discussion of the rise in incomes of farmers see David W. Bronson and Constance B. Krueger, "The Revolution in Soviet Farm Household Incomes, 1953–1967," in James R. Millar (ed), *The Soviet Rural Community*, University of Illinois Press, Urbana, 1971, p. 214–258.

[15] *The New York Times*, 30 January 1961.

[16] CFM prices are subject to ceilings on occasion. For example, "Certain cities have established maximum prices . . ." *Izvestiya*, 31 July 1970, ". . . the removal of price restrictions." *Sel'skaya zhizn*, 17 April 1971.

[17] *N. Kh. 1922–72*, p. 390.

Consumption

To discuss changes in real consumption, we have devised an independent measure of consumption based largely on Soviet data but using Western concepts. According to this index, per capita consumption increased at an average annual rate of 5.0 percent during 1965–72 (see Table 4). Trends in Soviet consumption are described below in terms of 5 broad categories: (1) food; (2) soft goods including clothing and shoes; (3) durable goods ranging from electric irons to automobiles; (4) personal and household services such as utilities, transportation, and personal care; and (5) health and education services.

TABLE 4.—U.S.S.R: RATES OF GROWTH OF PER CAPITA CONSUMPTION BY COMPONENT, 1965–72 [1]

[In percent]

	1965	1966	1967	1968	1969	1970	1971	1972	Average Annual 1965–72
Total per capita consumption	6.3	5.8	6.5	5.0	3.7	5.2	3.8	3.4	5.0
Food	5.9	4.5	6.1	3.1	1.5	4.9	3.7	2.0	3.9
Soft goods	5.4	7.1	7.4	7.6	5.8	5.5	3.3	4.3	5.8
Durable goods	12.1	11.4	8.2	9.5	6.4	6.8	4.2	4.8	7.9
Personal and household services	6.6	6.5	7.4	7.8	5.9	5.8	5.4	5.4	6.3
Health and education services	7.1	6.2	5.0	4.1	5.1	5.2	4.2	4.2	5.1

[1] See Appendix C for sources and methodology. The rates of growth differ somewhat from those published in the earlier Joint Economic Committee studies because the price base has been changed from 1955 to 1968 and the basis for deriving some items has been changed.

Food

Growth in food consumption, particularly quality foods such as livestock products, has fluctuated from year to year in response to variations in agricultural production. Thus, although per capita food consumption grew by an average of 3.9 percent per year during 1965–72, the annual rate varied from a low of 1.5 percent in 1969 to a high of 6.1 percent in 1967.[18] The effect on the individual may be even greater because the average does not reflect quality deterioration and greater distribution problems that are associated with poor agricultural years. Moreover, because of a distribution system favoring large cities, the swings in food supplies in small towns and rural areas are magnified.

As total consumption increased over the past 20 years, patterns of consumption changed drastically. Some of the most welcome improvement has occurred within the food component—especially with regard to quality. Since 1950 consumption of sugar more than tripled, that of fats and oils more than doubled and that of meat almost doubled (see Table 5).

TABLE 5.—U.S.S.R.: AVERAGE DIET, 1950, 1960, 1971 [1]

[Kilograms per year]

	1950	1960	1971
Meat	22.1	33.3	43.0
Fish	7.0	9.9	14.8
Milk (excluding butter)	116.6	146.5	182.5
Fats and oils (including butter)	9.1	15.6	20.5
Sugar	11.6	28.0	39.5
Grain products	172	164	149
Potatoes	241	143	128

[1] Consumption of food was estimated as described in Bronson and Severin, op. cit., pp. 520-21.

[18] Because food is such an important part of total consumption (about half), annual fluctuations in the food component index have a marked effect on the index of total consumption.

Because total calories have been adequate over the entire period, growth in consumption of these high quality foods has been accompanied by a reduction in the number of calories supplied by grain products and potatoes (see Table 6).

TABLE 6.—U.S.S.R.: AVERAGE DAILY DIET, 1950, 1971 [1]

[In percent of calories]

	1950	1971
Meat and fish	5	8
Milk (excluding butter)	7	9
Fats and oils (including butter)	7	13
Sugar	4	12
Grain products and potatoes	71	*52
Fruits, vegetables, eggs	6	6

[1] Data in table 5 converted to calorie values with factors from UN, FAO, "Food Composition Tables for International Use," Rome, 1954.

Consumer gains were greater than these changes suggest, however. There has been a marked shift from reliance on home-produced food to purchased food. By 1970 private plots and in-kind payments supplied less than one-fifth of collective farm families' food; 72 percent was purchased in state stores and 9 percent in collective farm markets.[19] Methods of distribution in the U.S.S.R. in 1950 were similar to those in the U.S. in the 19th century. Packaging and processing for most food did not exist. When marketing, consumers had to bring their own containers and wrapping paper. Although the revolution in food distribution that occurred in the U.S. several decades ago has yet to occur in the U.S.S.R., the situation has improved.[20] In 1950, for example, vegetables were available in bulk only during the harvest season or for as long as they could be held in storage; no vegetables were packaged fresh, few were canned, and even fewer were canned in sizes suitable to home use. By 1971, vegetable storage facilities had tripled over 1950 levels and refrigerated storage, though still limited, had grown by nearly 12-fold.[21] Thus produce can be held longer and in better quality. Far more vegetables were being canned and canned attractively; the number of cans of vegetables and tomatoes (in standard cans) grew 7.5-fold, from 486 million in 1950 to 4131 million in 1971.[22] A few frozen vegetables—production was 6.7 thousand tons in 1971 [23]—were appearing, and some fresh vegetables were sold prepackaged. Confectionary products, fruits, cheese, and flour and bread are other foods that have experienced marked improvements via increased or new processing. Many of these improvements cannot be reflected in the index.

Soft Goods

Per capita consumption of soft goods has grown by an average of 5.8 percent annually since 1964, recovering from the near stagnation of the

[19] I. N. Shutov, *Lichnoye potrebleniye pri sotsializme,* Moscow, 1972, p. 149.
[20] The retailing of packaged goods is making slow gains. For example, in 1950, about 3 percent of sugar was prepackaged, by 1968, the share was 9 percent. In 1950, no meat was prepackaged, by 1968 slightly over 3 percent was. Neither butter nor margarine were packaged in 1950, by 1968, 1.4 percent of butter and 21 percent of margarine were packaged. M. G. Lerner. *Effektivnost' truda v roznichnoy torgovlii,* Moscow, 1971, p. 79.
[21] *N. Kh. 1922–72,* p. 415.
[22] *Ibid.,* p. 212.
[23] *Ibid.,* p. 209.

early 1960s. Growth has been stimulated in part by substantial imports of better quality goods, but more by much higher farmer incomes that, combined with increased transfers of goods from urban to rural stores, have enlarged the market for soft goods. This stimulus may now be less effective. During 1971–72, growth in per capita consumption slowed to 3.8 percent, suggesting that much of the unsatisfied rural demand for soft goods has been met, at present levels of quality and assortment. In fact, as a result of consumer resistance to poor quality, an inventory accumulation problem similar to the one that occurred in the early 1960s may be developing.

A shift from home production to purchased goods has been particularly notable in the soft goods sector. Fabrics that were turned into clothing at home accounted for 42 percent of retail sales of soft goods in 1950, and only 12 percent of retail sales in 1971. Readymade clothing, on the other hand, grew from 24 percent in 1950 to 38 percent of retail sales of soft goods in 1971. The change in the share of knitwear was still greater, from 5 percent in 1950 to 18 percent in 1971.

Although the quality of Soviet soft goods is still far below the average Western level, it is noticeably better. Visitors to the Soviet Union comment on the greater availability of clothing and shoes, the more attractive and wider range of style and color.[24] Imported soft goods, especially clothing and shoes, are extraordinarily popular and increasingly available. Indeed, imports of soft goods from Western countries have increased 19-fold since 1960.

Durable Goods

Until 1971, per capita consumption of durable goods increased much faster than other categories of consumption, although it slowed from an average rate of 15 percent annually in 1951–65 to 8.4 percent per year in 1966–70 and 4.5 percent annually in 1971–72.[25] The slowdown may be in response to declining demand.[26] In 1972, for example, production of both washing machines and television sets, items that had begun to accumulate in warehouses, was sharply curtailed. Unlike soft goods, planners have been able to prevent large inventories of unsalable durable goods. Demand has been easier to measure for durable than for soft goods, and production has been better controlled. In many cases, durables are only a secondary item of production for industrial managers, so they are willing to cut back production in the absence of demand. Soft goods, however, are usually the sole product of a factory, and managers, who are awarded according to output, are reluctant to stop production or even interrupt it long enough to produce new goods that consumers want.

Of all consumer sectors, that of durable goods has seen the greatest change. With the exception of sewing machines, radios, and some furni-

[24] In fact, at least one U.S. specialty buyer has imported several Soviet designs and anticipates no problems in selling them. *Washington Post*, 10 February 1973.

[25] There is some question as to the validity of the durables component of the index, which, in 1971, began to slow much more rapidly than did production of goods of *kul'turno-bytovogo naznacheniya* (household use). In previous years rates of growth of the two indicators were reasonably similar. The divergence suggests the durable component of our index fails to include adequate adjustment for upgraded assortment and quality and new products, particularly in recent years.

[26] Reports that waiting periods and sign-up lists are no longer needed except for certain refrigerators and automobiles confirm the hypothesis that consumers have acquired adequate supplies of durable goods.

ture and sporting goods, few consumer durables were produced in 1950. By 1955, the picture had changed—refrigerators, washing machines, television sets, and vacuum cleaners though scarce, were becoming more available. By 1971, more than 1 in 3 families had refrigerators, and 3 out of 5 had television sets and washing machines. Waiting lists, so common a few years ago, have almost disappeared. One need register only for a car or for some models of the more desirable refrigerators. As one manager expressed it: "Yesterday he bought a television set, and today he dreams of a car. . . ." [27]

The demand for automobiles is extremely strong and will remain strong for many years although the supply is growing rapidly. Sales of automobiles to individuals averaged between 60 and 70 thousand per year during the 1960s but jumped to 123 thousand in 1970, 222 thousand in 1971, and 377 thousand in 1972. Despite these increases, purchases of automobiles accounted for only 2 percent of all durables purchases in 1972, and it will be many years before the Soviet automobile achieves the share of durable expenditure noted in Western Europe, to say nothing of the United States.[28]

Services

Growth in consumption of personal and household services was fairly steady during 1965–72, averaging 6.3 percent per year; growth in health and education services has also been steady, but somewhat lower, averaging 5.1 percent per year. As with the material components of consumption, the services components registered lower growth rates during 1971–72 than for the period as a whole, 5.4 and 4.2 percent, respectively. Although rates of increase are declining, improvements are more and more visible.

By Western standards the supply of personal and household services available to consumers is still extremely limited. Nevertheless, marked progress has been made in the range and quality of services provided. The population is using a growing share of its income for transportation and for utilities. Even the supply of housing, long one of the most distressing consumer problems, has grown steadily; the total stock more than doubled between 1951 and 1972.[29] However, space alone does not adequately measure the improvement that has occurred. There has been a substantial increase in privacy—fewer people per room and more apartments with private kitchens and baths—and far more apartments with central heating and hot water.

Soviet achievements in health and education are impressive and well known. The quality of some communal services, however, particularly in the health area and in the provision of day care for children, remains below desired levels. According to Bernice Madison, 50 percent of all urban children were attending pre-school facilities in 1970, while the figure for rural children was only 30 percent.[30] In an economy where

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[27] *Sel'skaya zhizn*, 24 January 1973.

[28] See the article by Imogene Edwards, Part III of this compendium, for a detailed discussion of the automobile situation in the U.S.S.R.

[29] For a fuller discussion of the housing situation, see the article by Willard Smith in Part V of this compendium.

[30] Bernice Madison, "Social Services for Families and Children in the Soviet Union Since 1967," *Slavic Review*, December 1972, p. 831.

most wives must work, and grandparents can no longer be relied on to care for children, the shortage of day care is worrisome.

Although households continue to spend inordinate amounts of time shopping for necessities—estimates range as high as 2 hours per day [31]—retail trade facilities are improving. There are more stores, and many of the new ones are well designed, the number of sales personnel relative to total population has increased, more packaged products are being marketed, and self-service stores are spreading slowly.[32]

III. Consumer Welfare in the 1970s

In general, the blueprint for the 1971–75 plan does not call for a radical shift in either production or allocation policies. According to the plan directives, per capita consumption will rise by 4.0 percent annually during 1971–75, somewhat less than the rate of 5.2 percent achieved during 1966–70 (see Table 7). The current goals seem to be a continuation of the recent trends toward greater realism in dealing with the consumer. Khrushchev made pie-in-the-sky pledges regarding consumption but did not allocate sufficient resources to fulfill these promises. In 1966–70, for the first time in Soviet planning history, medium-term goals for consumption were met.

TABLE 7.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF CONSUMPTION BY COMPONENT, 1966–70, 1971–75 PLAN

[In percent]

	1966–70	1971–75 Plan
Total per capita consumption	5.2	4.0
Food	4.0	3.0
Soft goods	6.7	2.9
Durable goods	8.4	12.9
Services	5.9	5.5

The fulfillment of goals for increases in the supply of quality foods during 1971–75 would permit a further decline in the share of daily calories obtained from the starchy staples—potatoes and grain. Meat consumption, for example, is slated to rise by 20 percent and that of dairy products by 12 percent. The volume of state-provided everyday services is to double by 1975 for the country as a whole and nearly triple in rural areas. Such expansion will be welcome, although the backlog of needs in these long-neglected areas will still be great. The total value of such services in 1970 amounted to about 4 billion rubles, roughly 16 rubles per capita—enough for a man to have a haircut every other week or for a woman to have her hair washed and set seven times a year.

Production of consumer durables is scheduled to expand during 1971–75 at a rate considerably in excess of the rate recorded during 1966–70. If plans are met, most Soviet families will have basic appli-

[31] *Izvestiya*, 16 October 1969.

[32] Most retail stores, however, still retain the traditional cumbersome purchasing process: a line to ask for the product and get the price, a second line to pay and get a receipt, a return to the first line to trade receipt for product.

ances by 1975. According to Soviet claims, of every 100 families, 72 will have television sets and washing machines, 64 will have refrigerators, and 85 will have radios. (These claims are somewhat exaggerated inasmuch as they make little or no allowance for the retirement of worn-out appliances.) The availability of automobiles during the current planning period is a major issue. If plans are met, car sales to the public during 1971–75 could absorb approximately one-fifth of the 60 billion rubles currently held in saving accounts and thus ease inflationary pressures while boosting consumer morale. It is estimated that in 1975 there will be about 3 million privately owned cars in the U.S.S.R., nearly three times the number in 1970, but still only about one car per 100 Soviet citizens.

Planned growth in the consumption of soft goods is down somewhat from the level of the past five years. This may reflect a planned decline in the level of imports of soft goods—chiefly readymade clothing and shoes—which boosted consumption sharply in the late 1960s. In addition, it may reflect the elimination of, or at least a substantial reduction in, the production of poor-quality goods.[33]

Income goals for 1971–75 announced in the five-year plan suggest a renewed effort by the regime to stifle inflationary pressures. Although substantial increases are planned for all the major sources of income in the current planning period, the rate of these gains will be less than those achieved during 1966–70. Much of the increase in income will come from a "something-for-everyone" welfare package to be introduced during 1971–75. The current welfare program, which includes 14 separate measures and is slated to cost the regime 22 billion rubles, will add approximately 86 rubles, or about 10 percent, to per capita incomes by 1975. The addition to total money incomes during 1971–75 will be about one-fifth larger than the increment during the preceding five-year period.

The welfare measures fall into three categories. First, a number of wage adjustments will affect the earnings of nine of every ten wage and salary workers. Second, revisions in pension and benefit programs will affect the welfare of all workers and their families and will be the source of the biggest addition to incomes in the current period. Third, the repayment of compulsory mass-subscription loans, frozen since 1958, will begin.[34] Specific welfare measures and the dates of their implementation are shown in Table 8.

The economy's performance in 1971–72 has probably foreclosed the possibility of meeting the primary goals of the 1971–75 plan. Indeed, the magnitude of the 1972 shortfalls forced Soviet planners to abandon many of the detailed targets for 1973 which had been set out in the five-year directives. Although growth in the production of consumer goods in 1973 has been cut back sharply from earlier plans, there is as yet no evidence of a basic shift in priorities. These pri-

[33] Continued production of poor quality goods is clearly of concern to the authorities who are urging improved quality in production and emphasizing the need to "meet contract obligations." The establishment of direct contractual relations between light industry and retail trade, begun in mid-1964, has not yet solved the problem of matching supply and demand for soft goods, and does not appear likely to do so in the near future.

[34] These loans, introduced during World War II, amounted to two to three weeks' wages annually, and were treated by the state as budget revenues. Although the loans provided large sums of income to the state in the 1950s, rising expenditures for interest and loan redemption threatened to result in a net outflow. As a consequence, the state announced termination of loan sales and a 20-year moratorium on repayments.

orities, as reflected especially in the 1971–72 investment plan, gave great weight to agriculture and put other consumer interests on a more equal footing with heavy industry. Analysis of the 1973 plan reveals the same emphasis.[35]

TABLE 8.—*U.S.S.R.: Scheduled Welfare Measures*

1971—The minimum wage will be increased from 60 to 70 rubles a month.
The wages of railroad workers and machine operators in agriculture will be raised.
Old age pension rates will be improved.
Taxes will be reduced for low-income workers.
1972—Regional wage differentials will be boosted.
The pay of doctors and teachers will be raised 20 percent.
Stipends to students will increase 25 percent to 50 percent.
1973—Wage increases for medium-income workers in "productive" branches working in the southern regions of the country.
Survivors pensions will be raised for servicemen's families.
Leave to care for children will be lengthened.
1974—Pay will be raised for medium-income workers in the "productive" branches who have not yet received pay adjustments.
Worker disability pensions will be boosted 33 percent.
Survivor pensions will be increased 20 percent.
Subsistence payments will be introduced for children of low-income families.
Annual repayments will begin on subscription loans.

The expected slowdown in the output of consumer industries in 1973 also forced a change in income policy. Average wages are now scheduled to grow in 1973 at only about three-fifths the rate originally planned. In light of the renewed pledges to carry out the 14 point welfare program as scheduled and the past history of overfulfillment of income goals, the regime may find their 1973 income plans unrealistically low.

Whereas the basic goals for consumers in the current five-year plan are the traditional ones of across-the-board expansion of goods and services, the problems of attainment have shifted somewhat since the early 1960s, when any consumer item produced would be sold. In recent years, there has been a buyer's market for almost all consumer manufactured goods—with the major exceptions of automobiles and quality foods such as meat. Traditional methods of central planning and administration, however, do not provide a mechanism for adjusting quickly to changing demand. Enterprise managers hesitate to innovate when changes may lead to underfulfillment of plan; they will instead continue to produce goods they know are unwanted. As noted above, waiting lists (except for cars and housing) have almost disappeared in the Soviet Union, and rates of inventory accumulation in soft goods are approaching those of the early 1960s.[36] Once again the press is signaling problems. "During the last 3 years . . . sales of clothing and underwear increased 2 times less than the growth of trade stocks . . . (the same occurred) with sales and stocks of leather shoes." [37] Furthermore, inventories of some durables, such as radios, are beginning to accumulate.

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[35] See the article by James H. Noren and Douglas Whitehouse, Part III of this compendium, for details.
[36] By 1971, the latest year for which data are available, soft goods inventories had reached 40% of the value of retail sales.
[37] *Sel'skaya zhizn*, 13 December 1972.

Unsatisfied demand for high quality foods has been particularly visible in recent years, finding expression in (1) lengthening queues in state stores where prices are fixed, (2) reports of shortages or complete absence of supplies, and (3) rising prices in the collective farm markets. Fueled by rising incomes, the excess demand for meat was particularly strong during the late 1960s, when meat production was growing relatively slowly. Beginning in mid-1969 there were sporadic reports of prolonged local shortages. A strong upward trend in collective farm market meat prices was noted throughout the year. Early in 1970 the regime augmented domestic supplies by purchasing 165 thousand tons of meat. Imports of a further 225 thousand tons in 1971 and a step-up in domestic production eased the supply situation and Moscow collective farm market meat prices declined slightly from the 1970 peak. Per capita consumption grew by 3 percent in 1972, reaching nearly 98 pounds, 40 percent above the level in Khrushchev's last year (1964) but was still below that of Western countries. Though meat supplies improved, shortages of other foods, primarily fruits, vegetables, and potatoes were noted in 1972, largely as a consequence of the summer drought.

Appendix A

Comparison of Independent and Official Soviet Indexes of Real Income and Consumption

Although the U.S.S.R. has published indexes of real per capita income and a good deal of material bearing on consumption trends and levels, we have elected in this paper to present our own indexes of real money income and consumption. We have calculated independent measures because the official information is incomplete, too aggregated, or cannot be verified. In the following sections, we will compare the official measures with our measures insofar as comparison is possible. In addition, we will comment briefly on some of the relative advantages and disadvantages of the alternative measures of real income and consumption. The discussion, however, is by no means complete. The deficiencies of our indexes should be clear from the outline of their construction given in Appendixes B and C, below. For an exhaustive treatment of the shortcomings of the Soviet indexes, the reader should consult the articles by Professors Gertrude Schroeder, Marshall Goldman, and Morris Bornstein in a recently-published symposium.[1]

Index of Real Income

The official Soviet measure of per capita real income (per capita real income of the "population") has a number of defects that reduce its analytical usefulness. The high degree of aggregation of the index masks shifts in the relative importance of the individual components of the index that are of substantial interest. Since it is expressed only as an index, the actual level of real income is not revealed. Most importantly, the contents and method of calculation are not described sufficiently to permit a judgment as to what is being measured or how well it is done.

Professor Gertrude Schroeder recently made a careful but not completely successful effort to determine the contents of the index.[2] She decided that the index clearly included more than the deflated summation of money incomes plus benefits minus taxes.[3] Rather, according to Professor Schroeder, the index may represent "the expenditures counterpart to the consumption fund in Soviet national income terminology."[4] Her attempts to duplicate the index through various combinations of inputs produced results that in every case showed substantially higher growth rates than the official series.

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[1] *Soviet Economic Statistics*, Vladimir G. Treml and John P. Hardt, ed., Duke University Press, Durham, N.C., 1972.
[2] *Ibid.*, p. 303–312.
[3] *Ibid.*, p. 305.
[4] *Ibid.*, p. 306.

Our independent measure of per capita real income tries to provide some of the information lacking in the official Soviet measure. Unlike the official series, it measures the magnitude of as well as the trends in incomes and reveals the composition of incomes. Moreover, knowing how the estimate is put together permits an evaluation of its shortcomings. The rates of growth of the official series and our independent estimate of real income in the U.S.S.R. are compared in Table A–1. The details of our reconstruction can be found in Appendix B, Table B–1.

TABLE A–1.—U.S.S.R.: COMPARISON OF AVERAGE ANNUAL RATES OF GROWTH OF OFFICIAL INDEX OF REAL PER CAPITA INCOME AND INDEPENDENT ESTIMATE OF REAL PER CAPITA MONEY INCOME[1]

[In percent]

	1951–55	1956–60	1961–65	1966–72	1951–72
Official index (real per capita income of the "population")	6.8	5.7	3.5	5.4	5.4
Independent index (real per capita disposable money income)	10.4	6.0	5.6	6.2	7.0

[1] Appendix B, table B–1.

Our independent index of real per capita disposable money incomes increases faster than the official index of per capita real income of the population in each of the periods considered—but especially in 1951–55 and 1961–65. Some of the difference simply reflects the difference between total real income and total money income. The official index reportedly includes income-in-kind, whereas our measure of real disposable money income does not. The importance of income-in-kind has been falling both relatively and absolutely, so an index of real total income should grow more slowly than an index of real money incomes. This is not the whole story, however. A rough adjustment of our index for income in-kind produces an index that increases by 6.2 percent per year between 1950 and 1970, while the official index grows by 5.6 percent per year. In addition, money incomes are the dominant element in both measures, and the decline in the role of income-in-kind payments has been fairly continuous. Therefore one would expect year-to-year changes in the official measure and our measure to be in the same direction. Inexplicably, this is not always the case. In three of the past 10 years, the rate of growth of one index has increased while the rate of growth of the other index has declined.

Perhaps the most serious shortcoming of our estimates of real money incomes in the U.S.S.R. lies in the price deflator, which is derived by combining the official state retail price index with the official collective farm market price index. The official Soviet measure relies on the same sort of price indexes, so it is also subject to error on this count.[5] The information that is available on construction of Soviet retail price indexes has led Western analysts to doubt their usefulness.[6] For example, temporary prices and prices of "new" and "improved" products are not included in the official index. Thus a persistent but unreported rise in average prices paid by Soviet consumers may have been occurring over the years. Using official indexes may therefore result in too small a degree of deflation of money incomes.

Measures of Consumption

Several types of consumption data are published by the U.S.S.R.: national income, budget survey, retail trade, stocks of goods, and per capita consumption of food and soft goods. Although some of these measures do indicate some specific changes in consumption, no one measure provides a complete and true picture of the level of total consumption or of the substantial changes in real consumption that have been occurring.

Soviet statistics divide national income into consumption and capital accumulation (investment broadly defined) with consumption subdivided into (1) personal consumption of material goods (including home consumption of food produced on individual plots and in-kind payments), (2) materials purchased

[5] In addition to retail and collective farm market prices, indexes of non-village collective farm market prices, rent and housing-related charges, and prices for personal repair and related services are weighted into the official Soviet deflator.

[6] *Ibid.*, p. 307–312.

by institutions serving the population, and (3) materials purchased by scientific institutes and government administration. Personal consumption accounts for about two-thirds of national income. According to this Soviet measure, between 1965 and 1972 personal consumption on a per capita basis grew at an average annual rate of 6.6 percent. Our index of consumption increased by 5.0 percent per year during the same period.

But Soviet national income cannot be used to measure total consumption for two reasons: (1) the Marxian concepts employed exclude all work done outside the branches of "material" production, that is, service producing sectors—health, education, personal transportation, recreation and so on—are not included, and (2) price changes are not taken into account.[7] In 1965, a detailed distribution of the consumption fund by product group in 1959–63 was published.[8] The published data show total expenditures for goods in current rubles and indexes of rates of growth for some of the major categories of consumption expressed in constant prices. Various cross checks indicate the current price data are consistent with other data issued in official publications. Unfortunately, neither the detailed publication nor the constant price series has been repeated.[9]

The U.S.S.R.'s Central Statistical Administration also maintains a continuous sample survey of family incomes and expenditures. The sample includes 62,000 families of wage and salary workers and collective farmers who are personally interviewed each month. In addition, there are periodic local or national surveys that are more intensive. The survey samples are sufficiently large so that if proper sampling procedures are used, an accurate picture of national consumption patterns would emerge. Unfortunately, although extremely detailed information is collected and compiled, very little is published. Moreover, there has been serious Western and Soviet criticism of the representivity of both the continuous and the periodic surveys.[10]

Recently published data illustrate the shortcomings of most Soviet consumer surveys (see Table A–2). Published with no explanation other than that contained in the title, the survey (or surveys) was designed to demonstrate progress in consumer welfare. If at all representative, the survey also reveals a large gap between the amount of high quality food consumed by urban and rural families, but one that is being narrowed rapidly. That the data represent average workers is suspect, however; it seems likely that lower income workers are excluded. To buy the reported food ration would cost the worker about 440 rubles, or more than 1750 rubles for a family of four.[11] With an average worker wage of about 1550 rubles per year, two incomes would be necessary to purchase the "average" worker ration, to say nothing of purchasing the food products not listed, such as butter and vegetable oil or alcoholic and non-alcoholic drinks.

Data on retail trade, stocks of durables, and consumption of selected foods and soft goods are useful as indicators of change, and in some cases, such as food products and stocks of durables, may measure total consumption of the given good (see footnote 14, p. 397). They do not, however, measure total consumption of all goods and services. Much food, for example, is home grown, while stocks of some durables seem to be based on production data, unadjusted by retirement rates.

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[7] Abraham S. Becker, "National Income Accounting in the USSR," in Treml and Hardt, *op. cit.*, p. 97, provides a complete series of national income. In order to measure real changes in consumption, the regularly published current price series on personal consumption must be deflated to constant prices. No adequate deflator is published. See Morris Bornstein, *op. cit.*, p. 371.

[8] *N. Kh. 64*, p. 580–89. The table is entitled "Consumption of food and nonfood goods by the population and material expenditures of institutions serving the population, of scientific organizations and of government from 1959–63."

[9] A comparison of the constant price series with parts of the computed index demonstrated the methodology used to derive the computed index is adequate (see Bronson and Severin, *op. cit.* p. 522–25). Some of the problems highlighted by the comparisons have subsequently been reduced by changes in methodology.

[10] The continuous survey, for example, is not representative of the entire population; lower and higher income groups of the population are not adequately covered. N. I. Buzlyakov, *Metody planirovaniya povysheniya urovnya zhizni*, Moscow 1969, p. 168. See also Marshall Goldman, *op. cit.*, p. 321–31, for a discussion of the drawbacks in Soviet survey data, and problems the planners face in trying to use them as a basis for predicting demand.

[11] The peasant ration costs roughly 410 rubles but is not an accurate reflection of real cost because the peasant produces some of his own food. The cost of both rations is based on the assumption that only lowest quality foods are purchased.

TABLE A-2.—CONSUMPTION OF FOOD PRODUCTS IN WORKER FAMILIES OF MOSCOW, LENINGRAD, KHARKOV, DONBASS, GORKY, SVERDLOVSK, AND IVANOVSK OBLASTS[1]

[Kilograms per capita]

	1922	1960	1965	1971
Meat and fat	11.0	61.1	62.3	81.4
Milk and milk products	62.1	334.7	334.0	388.6
Eggs (number)	10	158	177	275
Fish and fish products	10.0	12.7	16.0	18.1
Sugar	4.1	32.2	34.2	35.5
Potatoes	140.0	119.9	125.8	115.7
Vegetables and melons	58.4	89.4	93.5	97.9
Fruit and berries	5.9	30.3	35.4	48.5
Grain products	241.8	137.2	131.5	119.6

CONSUMPTION OF FOOD PRODUCTS IN PEASANT FAMILIES OF VOLOGDA, TAMBOV, RYAZAN, VORONEZH, AND OREL OBLASTS[1]

Meat and fat	9.1	35.1	38.4	48.5
Milk and milk products	86.2	306.4	314.5	368.7
Eggs (number)	26	152	193	291
Fish and fish products	1.2	6.1	10.2	14.9
Sugar	.4	15.9	28.9	42.4
Potatoes	212.9	215.9	217.2	199.6
Vegetables and melons	69.7	77.0	70.8	70.0
Fruits and berries	11.7	12.4	25.5	33.8
Grain products	202.4	181.4]	180.3	177.7

[1] N. Kh. 1922–72, p. 384.

Appendix B

Estimate of Personal Disposable Money Income in the U.S.S.R.

The following table represents an update of estimates of personal money income in the U.S.S.R. that appeared in our 1966 article for this committee (Bronson and Severin, *op. cit.*, p. 525–28). Subsequent information has resulted in minor modifications in the original estimates. For example, the U.S.S.R. has changed its reporting on earnings of wage and salary workers to include non-wage fund bonuses (1–2 percent of earnings). Since 1966, the U.S.S.R. has reported additional data which has facilitated our estimates: stipends to students and earnings of collective farmers are now reported regularly. Finally, in some cases such as profits distributed to cooperative members the estimating procedure has been modified, and this has affected the earlier estimate.

As a consequence of these changes, the estimates for personal disposable money income for 1950–65 have increased slightly over the estimate made in 1966. The estimate for total disposable income in 1950 shown below is 3.4 percent larger than the estimate made in 1966. For other years the changes are less—the new estimate for 1960 is 1.9 percent larger than the old estimate and for 1965, 1.3 percent larger.

In addition to updating the table to include estimates for the years since 1965, estimates for the components of state deductions have been added. Finally, it should be emphasized that little information is available for 1972 and therefore the estimate made for that year is preliminary and not documented.

TABLE B-1.—U.S.S.R.: PERSONAL DISPOSABLE MONEY INCOME, 1950, 1955, 1960, 1962–72

[In billions of rubles]

	1950	1955	1960	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1. Total money income	46.98	63.52	86.25	102.31	106.69	111.94	124.40	135.12	145.87	160.24	169.90	183.02	194.60	206.50
2. Gross earnings of wage and salary workers	31.14	43.30	60.00	71.06	74.64	79.82	89.07	95.85	103.37	115.09	123.34	132.03	140.20	148.87
3. Gross earnings of cooperative artisans	.88	1.17												
4. Collective farm wage payments	1.18	3.06	5.10	6.63	7.00	7.90	9.10	10.90	12.60	13.16	12.97	13.52	14.08	14.74
5. Net household incomes from sale of farm products	4.54	4.46	5.95	7.69	8.36	7.20	7.15	7.85	8.13	8.30	7.71	9.55	9.83	(1)
6. Profits distributed to cooperative members	.06	.14	.17	.09	.09	.10	.10	.11	.13	.13	.14	.15	.15	(1)
7. Military pay and allowances	4.40	4.50	3.77	4.00	3.70	3.38	3.28	3.28	3.28	3.28	3.38	3.38	3.48	(1)
8. Transfer payments	4.78	6.89	11.26	12.84	12.90	13.54	15.70	17.13	18.36	20.28	22.36	24.39	26.86	27.12
Pensions and welfare payments	3.70	4.77	9.90	11.50	11.90	12.50	14.40	15.80	16.90	19.00	20.70	22.81	25.00	25.80
Stipends to students	.46	.74	.63	.69	.75	.83	.87	.96	1.04	1.10	1.30	1.30	1.40	(1)
Loan service	.51	1.43	.70	.80	.48	.41	.47	.56	.73	.75	.81	.98	1.16	(1)
Insurance payments less premiums	.04	.04	−.03	−.08	−.08	−.12	−.13	−.21	−.27	−.51	−.40	−.67	−.67	(1)
Net borrowing	.07	−.09	.06	−.07	−.15	−.08	.09	.02	−.04	−.06	−.05	−.03	−.03	(1)
9. Total state deductions	6.56	8.26	5.80	6.23	6.56	7.04	8.05	8.84	9.65	10.98	12.15	13.39	14.18	15.08
10. Direct taxes	3.58	4.83	5.60	6.01	6.30	6.75	7.70	8.44	9.33	10.50	11.60	12.74	13.70	(1)
Personal income tax	2.04	3.55	4.64	5.08	5.40	5.86	6.77	7.50	8.36	9.50	10.54	11.61	12.57	(1)
Agricultural tax	.80	.44	.40	.38	.36	.35	.36	.35	.35	.34	.33	.33	.33	(1)
Bachelor and small-family tax	.74	.84	.56	.55	.54	.54	.57	.59	.62	.66	.73	.80	.80	(1)
11. Local taxes	.28	.29	.14	.16	.19	.18	.17	.18	.19	.20	.19	.18	.18	(1)
State fees	.03	.04	.04	.05	.05	.05	.05	.06	.06	.07	.07	.07	.07	(1)
Building tax and land rent	.13	.17	.07	.08	.08	.09	.09	.09	.10	.10	.10	.11	.11	(1)
Collections at collective farm markets	.04	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02			
Collection on transportation and livestock in cities	.08	.06	.01	.01	.04	.02	.01	.01	.01	.01				
12. State loans	2.70	3.14	.06	.06	.07	.11	.18	.22	.13	.28	.36	.47	.30	(1)
13. Total disposable income	40.42	55.26	80.45	96.08	100.13	104.90	116.35	126.28	136.22	149.26	157.75	169.63	180.42	191.42
14. Population (million persons at midyear)	180.1	196.2	214.3	221.7	225.1	228.1	230.9	233.5	236.0	238.3	240.6	242.8	245.1	247.5
Per capita disposable income (rubles)	224.4	281.7	375.4	433.4	444.8	459.9	503.9	540.8	577.2	626.4	655.7	698.6	736.1	773.4
15. Consumer price index (1950=100)	100.0	76.6	76.3	77.9	78.8	79.1	77.8	76.9	76.9	77.0	77.7	78.1	77.7	78.2
Per capita real disposable income	224.4	367.8	492.0	556.4	564.5	581.4	647.7	703.3	750.6	813.5	843.9	894.5	947.4	989.0
Index of real per capita disposable income (1950=100)	100.0	163.9	219.3	248.0	251.6	259.1	288.6	313.4	334.5	362.5	376.1	398.6	422.2	440.7
Annual increase in per capita real disposable income (percent)		[2] 10.4	[2] 6.0	[2] 6.3	[2] 1.5	3.0	11.4	8.6	6.7	8.4	3.8	6.0	5.9	4.4
16. Annual increase in per capita real income (Soviet official series)		[2] 6.8	[2] 5.7	[2] 2.4	1.4	4.8	6.8	5.9	6.7	6.1	5.0	5.6	4.5	3.7

[1] Not available. [2] Average annual.

SOURCES AND METHODOLOGY

1. *Total money income*

(*a*) 1950, 55, 60, 62–71—Sum of lines 2 through 8.

2. *Gross earnings of wage and salary workers*

(*a*) 1950, 55, 60, 62–71—*Narodnoye khozyaystvo SSSR 1922–1972*, Moscow, 1972, p. 345, 350 (hereafter, *N. Kh.*). Product of the average annual number of wage and salary workers and the average monthly earnings, adjusted to an annual basis. In 1968, the U.S.S.R. Central Statistical Administration changed the reporting of average wages to include bonuses from non-wage fund sources. Estimates in this table have been adjusted accordingly.

3. *Gross earnings of cooperative artisans*

(*a*) 1950, 55—Cooperative artisans reportedly earned a wage equal to two-thirds that of industrial wage and salary workers. U.S. Bureau of the Census, *Producers' Cooperatives in the Soviet Union*, by Frederick A. Leedy, International Population Reports Series, P-95, No. 51, Washington, D.C., p. 14. The average annual number of artisans is reported in *N. Kh. 1964*, p. 545. The average annual industrial earnings are from *Trud* v *SSSR*, Moscow, 1968, p. 140.

(*b*) 1960, 62–71—Producers' cooperatives were converted into state enterprises in 1960, and members were classified as state workers.

4. *Collective farm wage payments*

(*a*) 1950—Estimate derived as a residual, the difference between total money outlays and the sum of expenditures for obligatory payments to the state, repayment of long-term loans, deductions from income, production expenses, and administrative-economic expenditures.

(*b*) 1955, 1962–64, 1966–67—David W. Bronson and Constance B. Krueger, "The Revolution in Farm Household Income in the Soviet Union, 1953–67," in James Millar (ed.), *The Soviet Rural Community: A Symposium*, Urbana, 1971, p. 241.

(*c*) 1960, 65, 69–70—*N. Kh. 1970*, p. 383, adjusted downward for payments in-kind according to estimates in Bronson and Krueger, *op. cit.*

(*d*) 1968—*N. Kh. 1969*, p. 397—Adjusted downward 8 percent to account for in-kind payments.

(*e*) 1971—*N. Kh. 1922–1972*, p. 263—Adjusted downward 8 percent to account for in-kind payments.

5. *Net household income from sale of farm products*

(*a*) 1950–71—Unpublished estimates by Constance Krueger.

6. *Profits distributed to cooperative members*

Consumers' cooperatives constitute a separate trade network paralleling that of the state stores but designed primarily to service rural areas. These societies are usually composed of residents from a single village. Their primary function is to establish and to run local stores and restaurants. In 1968, the cooperatives had a membership of over 57 million people and operated 366,000 trade enterprises and 65,300 cafeterias and restaurants. In recent years the number of outlets has increased, but the number of societies has decreased. Nominally, the cooperatives system is controlled by its members, but the government actually exercises strict control over products and prices, and earnings.

E. Fonarev, *Raspredeleniye i ispol'zovaniye pribyli potrebitel'skoy kooperatsii*, Moscow, 1966, p. 69, reports that dividends distributed to individual shareholders totaled 9.9 million rubles in 1964. This is equal to 2.7 percent of the amount that cooperatives paid into the state budget in that year. This rate was applied to the reported budget payments for the years 1950–70.

(*a*) 1950, 55, 60, 62–64—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1966, p. 11.

(*b*) 1965–70—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1972, p. 12.

(*c*) 1971—Assumed to be the same as in 1970.

7. *Military pay and allowances*

(*a*) 1950, 1955—Estimate for 1957 adjusted for changes in the size of the armed forces. Abraham S. Becker, *Soviet National Income and Product, 1956–58*, Santa Monica, 1962, p. 2. (hereafter *SNIP*).

(*b*) 1960, 62–64—*SNIP, 1958–64*, p. 19.

(*c*) 1965–71—1964 estimate adjusted for changes in the size of the armed forces as reported by the Institute For Strategic Studies, *The Communist Bloc and Western Alliances: The Military Balance, 1965*, and subsequent annual issues.

8. *Transfer payments*

(*a*) Pensions and welfare payments—Includes state social insurance payments, state social assistance payments.

(1) 1950, 1965–67—*N. Kh. 1967*, p. 888.
(2) 1955—*N. Kh. 1958*, p. 905.
(3) 1960, 69–70—*N. Kh. 1970*, p. 732.
(4) 1962—*N. Kh. 1963*, p. 656.
(5) 1963–64—*N. Kh. 1964*, p. 772.
(6) 1968—*N. Kh. 1968*, p. 776.
(7) 1971—*N. Kh. 1922–1972*, p. 483.

(*b*) Stipends to students:

(1) 1950, 60, 65, 69–70—*N. Kh. 1970*, p. 537.
(2) 1955—*Raskhody po sotsial'no-kul'turnyye meropriyatiya no gosudarstvennomu budydzhetu SSSR*, Moscow, 1958, p. 46.
(3) 1962–64, 1966–68—Estimate based on the reported number of full-time students in higher and secondary-specialized education institutions.
(4) 1971—*N. Kh. 1922–1972*, p. 363.

(*c*) Loan service—Includes interest from state loans and savings deposits plus principal retirement of state loans. Beginning in 1963 interest payments on savings accounts were no longer reported in the state budget. *Vestnik statistiki*, No. 1, 1967, p. 22, reports interest on savings in 1965 amounted to 383 million rubles (2 percent of savings). Therefore 2 percent of reported savings was added to the loan service item reported in the state budget since 1963.

(1) 1950, 55—*N. Kh. 1958*, p. 900.
(2) 1960, 63–64—*N. Kh. 1964*, p. 595, 770.
(3) 1962—*N. Kh. 1963*, p. 654.
(4) 1965–68—*N. Kh. 1968*, p. 597, 774.
(5) 1969–70—*N. Kh. 1970*, p. 563, 730.
(6) 1971—*N. Kh. 1922–1972*, p. 373, 481.

(*d*) Insurance payments less premiums:

(1) 1950, 55—N. Laptev (ed.) *Finansy i sotsialisticheskoye stroitel'stvo*, Moscow, 1957, p. 355–56.
(2) 1960—Estimate based on *Finansy SSSR*, No. 2, 1967, p. 17, No. 3, 1972, p. 3, and No. 11, 1966, p. 21.
(3) 1962—Estimate based on *Finansy SSSR*, No. 2, 1967, p. 17, and No. 2, 1972, p. 66.
(4) 1963–64—Estimate based on *Finansy SSSR*, No. 2, 1967, p. 17, and No. 8, 1966, p. 23.
(5) 1965—Estimate based on *Finansy SSSR*, No. 6, 1969, p. 65, and No. 4, 1972, p. 3.
(6) 1966—Estimate based on *Finansy SSSR*, No. 2, 1967, p. 17, and No. 6, 1969, p. 65.
(7) 1967—Estimate based on L. Reytman, *Lichnoye strakhovaniye v SSSR*, Moscow, 1968, p. 4, and *Finansy SSSR*, No. 6, 1969, p. 65.
(8) 1968—Estimate based on *Finansy SSSR*, No. 12, 1968, p. 7, and No. 6, 1969, p. 65.
(9) 1969—Estimate based on *Finansy SSSR*, No. 5, 1969, p. 11, No. 12, 1970, p. 66, and *Ekonomicheskaya gazeta*, No. 41, 1971, p. 6.
(10) 1970—*Finansy SSSR*, No. 1, 1971, p. 13, and No. 4, 1972, p. 3.
(11) 1971—Assumed to be the same as in 1970.

(*e*) Net borrowing—The difference between long term loans to the population outstanding at the end of the given year and loans outstanding at the end of the previous year.

(1) 1950, 55—*Vestnik statistiki*, No. 2, 1960, p. 89–92.
(2) 1960, 62—*N. Kh. 1962*, p. 639.
(3) 1963—*N. Kh. 1963*, p. 658.
(4) 1964—*N. Kh. 1965*, p. 774.
(5) 1965–68—*N. Kh. 1968*, p. 779.
(6) 1969—*N. Kh. 1969*, p. 774.
(7) 1970—*N. Kh. 1970*, p. 735.
(8) 1971—*N. Kh. 1922–1972*, p. 486.

9. *Total state deductions*

(*a*) 1950, 55, 60, 62–71—Total of lines 10–12.

10. *Direct taxes*

(*a*) 1950, 55, 60, 62–65—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1966, p. 11.
(*b*) 1966–70—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1972. p. 12.
(*c*) 1971—*N. Kh. 1922–1972*, p. 481. It is assumed that the agricultural tax and the bachelor and small family tax in 1971 were the same as in 1970. Personal income tax was then derived as a residual.

11. *Local taxes*

Local taxes include: (1) state fees, (2) building tax and land rent, (3) one-time collections at collective farm markets, and (4) collections on means of transportation and on livestock in cities. The first three categories are paid by both individuals and institutions. The last category (4) is paid only by individuals and is derived as a residual. In addition, an "admission tax" paid solely by institutions is listed under local taxes (U.S. Bureau of the Census, *The Soviet Financial System: Structure, Operation, and Statistics*, Wasington, 1968, p. 127–28). It is assumed that one-half of the taxes in categories 1 to 3 and all of category 4 are paid by individuals.
(*a*) 1950, 55, 60, 62–65—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1966, p. 70.
(*b*) 1966–70—Reporting of admission taxes for 1966–68 is in *Mestnyye byudzhety SSSR*, Moscow, 1970, p. 11. It is assumed that this tax grew by 2% per year during 1969–70. *Gosudarstvennyy byudzhet SSSR*, Moscow, 1972, p. 77.
(*c*) 1971—Assumed to be at the 1970 level.

12. *State loans*

(*a*) 1950, 55, 60, 62–65—*Gosudarstvennyy byudzhet SSSR*, Moscow 1966, p. 11.
(*b*) 1966–70—*Gosudarstvennyy byudzhet SSSR*, Moscow, 1972, p. 12.
(*c*) 1971—*N. Kh. 1922–1972*, p. 481.

13. *Total disposable income*

(*a*) 1950, 55, 60, 62–71—Line 1 minus line 9.

14. *Population*

(*a*) 1950, 55, 60, 62–71—Midyear population estimates from U.S. Department of Commerce, *Projections of the Population of the USSR, by Age and Sex: 1969 to 1990*, Series P–91, No. 19, December 1969, p. 6.

15. *Consumer price index*

Derived by combining the reported state retail price index with the reported collective farm market price index, using 1955 weights of 91.3 for state retail prices and 8.7 for collective farm market prices. *Sovetskaya torgovlya*, Moscow, 1964, p. 39, 266.

16. *Annual increase in per capita real income (Soviet official series)*

In addition to money income, the official series includes income in-kind and the value of certain services provided the public.
(*a*) 1950, 55, 60, 62–67—*N. Kh. 1967*, p. 59.
(*b*) 1968–70—*N. Kh. 1970*, p. 537.
(*c*) 1971—*Pravda*, 18 December 1972.

Appendix C

Estimate of an Index of Consumption for the U.S.S.R.

The following tables update the U.S.S.R. Index of Consumption and present the data in greater detail than was given in our 1966 article for this committee (Bronson and Severin, *op. cit.*, p. 520–25). Table C–1 values, in rubles, consumption of each line item in the index. Table C–2 includes the component weights, shows the shifts in importance among the line items between 1950, 1960, and 1970, and presents the basic type of data used to derive each line item series. General source notes follow. Detailed source notes are available from the authors upon request. The estimates for 1972 are preliminary and may change appreciably as new statistical material appears.

Limitations of the Consumption Index

As with the income measure, construction of an index of consumption must proceed within limitations of Soviet data. The index therefore cannot be viewed as a very precise measure of changes in consumption between two consecutive years. Nevertheless, it is believed to be a reasonably accurate indicator of Soviet real personal consumption over time. The basic data are fairly reliable, double counting has been reduced to a minimum, and the sample and weights are adequate. On the other hand, the improvement in quality of goods and services that has occurred over time cannot be incorporated satisfactorily.

Basic Data

Nearly two-fifths of the line items presented in the index (see Appendix Table C–1) are based directly on official Soviet production series expressed in physical units or value terms.[12] About one-third are based on retail sales data, another 20 percent (the services sectors) is based on estimated expenditures, and the remaining few line items are based on Soviet reports of quantities consumed. Soviet production series in units are generally believed to count the actual number of given items produced during a given period. To eliminate double counting of products at different stages of production, the portion undergoing further processing has been netted out of the quantity available for human consumption. For example, flour and sugar used in confectionary products are subtracted from total flour and sugar consumed, adjustments are made for produce used in canning, and so on. Similarly, series on the value of production in current prices are believed to be the actual value of goods produced and retail sales series represent summed sales.[13] Finally, the Central Statistical Administration says that Soviet food consumption in kilograms is carefully done by a balance method rather than by relying solely on budget or production data.[14]

The unit prices used to aggregate the production-based series and the price indexes used to deflate the retail sales series are less satisfactory. Individual prices are based on Moscow observations or on official price handbooks that may or may not reflect real retail prices, and are adjusted for regional variations. Although the average prices may not be exact, the relative levels—for example, between meat and fruit—are reasonably accurate. The numerous drawbacks to official price indexes as deflators have been well-documented elsewhere.[15] Nevertheless, their use is necessary because personal consumption of several important goods such as fabrics and vegetable oil cannot be measured accurately by production series; the various intermediate or non-consumption uses cannot be estimated reliably.

Sample

An effort was made to assemble as complete and representative a basket of goods and services in as much detail as possible from regularly published data. The sample includes roughly 90 percent of consumption. The items not represented, such as soap and toys, are believed to be relatively unimportant, and their absence probably does not bias the index seriously.

Weights

The expenditure weights used to aggregate the component indexes—food, soft goods, and so forth—are not published magnitudes. Rather they are constructed partly from fragments of information such as average rent per square meter of housing, and partly from estimates such as food consumed in-kind. The resulting weights probably are not grossly wrong but clearly are not as precise as one might wish. The price or purchase weights used to aggregate the line items within the components are more reliable—about 60 percent are based on published data in the base year. The remainder are based on adjusted production valued at prices of the base year or on estimated total expenditures.

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[12] Production series are adjusted for trade and inventory changes insofar as possible.

[13] Charges that there is systematic over-reporting of retail sales in an effort to meet sales plans are not borne out by Soviet writers (who have been frank about over-reporting in the agricultural sector). Noted instances of over-reporting seem to arise from incorrect pricing of individual goods rather than artificial inflation of the total group.

[14] *Vestnik statistiki*, No. 2, 1968, p. 48–50. Balances worked out, by us, for the few foods in the index that are based on consumption data indicate the quantities are at least reasonable and consistent with production and utilization data. Data for some foods such as milk (not used in the index) are not consistent.

[15] Bornstein, *op. cit.*, p. 371 ff.

TABLE C-1.—U.S.S.R.: INDEX OF CONSUMPTION

[In millions of 1968 rubles]

	1950	1955	1956	1957	1958	1959	1960	1961	1962	1963
Food:										
Animal products:										
Fish	515	837	912	990	1,095	1,087	1,183	1,213	1,279	1,434
Meat	9,266	12,778	13,289	14,497	15,190	16,855	17,031	17,202	17,996	18,753
Slaughter fat	1,406	1,976	2,090	2,470	2,489	2,831	2,641	2,793	3,040	3,287
Milk	5,788	6,674	7,531	8,276	8,879	8,815	8,564	8,408	8,482	8,329
Butter	1,479	2,040	2,324	2,506	2,797	2,873	2,989	3,063	2,983	3,048
Cheese	179	384	435	464	512	534	589	621	694	729
Eggs	1,466	2,325	2,444	2,800	2,880	3,209	3,447	3,672	3,778	3,580
Processed foods:										
Sugar	1,346	3,179	3,327	3,494	3,650	3,863	4,535	4,801	5,018	5,360
Vegetable oil	222	541	626	627	595	625	669	717	748	787
Margarine	263	561	616	644	610	642	688	709	746	832
Confectionery	1,206	2,005	2,080	2,318	2,470	2,619	2,800	2,956	3,188	3,510
Alcoholic and soft drinks	4,313	8,713	8,952	10,484	9,625	10,058	11,023	11,536	12,066	13,427
Canned goods	892	1,830	2,097	2,370	2,558	2,778	3,022	3,392	4,257	3,843
Macaroni	157	379	346	389	418	401	439	438	477	542
Basic foods:										
Potatoes	6,816	4,555	4,649	4,760	4,869	4,963	4,806	4,901	4,947	4,947
Vegetables	2,716	4,093	4,105	4,241	4,245	4,204	4,647	4,469	4,304	3,093
Fruits, berries and grapes	1,021	1,295	1,078	1,759	1,885	1,800	1,639	1,552	1,799	1,928
Flour and groats	7,421	9,370	9,398	9,351	9,136	9,258	9,239	9,276	9,370	8,939
Total	46,472	63,535	66,294	72,431	73,903	77,415	79,951	81,719	85,172	87,368
Index 1968=100	41.4	56.5	59.0	64.4	65.8	68.9	71.1	72.7	75.8	77.7
Soft goods:										
Cotton cloth	1,670	2,456	2,181	2,245	2,140	2,278	2,299	2,058	1,967	1,884
Wool cloth	757	671	889	1,130	1,232	1,245	1,470	1,365	1,244	1,131
Silk and rayon cloth	302	860	1,055	1,314	1,356	1,301	1,344	1,289	1,372	1,364
Linen cloth	136	117	159	207	230	235	254	243	217	210
Sewn goods	2,968	5,578	5,968	6,305	6,795	7,476	8,084	8,619	8,966	8,781
Hosiery	515	840	874	918	966	1,007	1,050	1,089	1,124	1,220
Leather shoes	1,810	2,355	2,583	2,874	3,229	3,466	3,716	3,955	4,168	4,151
Tobacco	814	1,200	1,268	1,320	1,370	1,423	1,492	1,534	1,563	1,642
Knitwear	985	2,101	2,110	2,259	2,412	2,630	2,829	2,942	3,127	3,336
Haberdashery	507	942	1,046	1,267	1,397	1,507	1,696	1,816	1,967	1,994
Total	10,464	17,120	18,133	19,839	21,127	22,568	24,234	24,910	25,715	25,713
Index 1968=100	29.1	47.7	50.5	55.2	58.8	62.8	67.5	69.3	71.6	71.6

Consumer durables:										
Automobiles	25	69	59	55	65	49	67	59	65	86
Bicycles and motorcycles	32	182	199	245	260	360	451	464	515	569
Radios and television sets	102	474	524	513	629	734	874	954	994	1,139
Watches and clocks	141	295	308	321	336	357	380	381	383	336
Electric appliances	40	140	186	231	262	311	381	464	558	635
Sewing machines	34	109	133	157	182	201	219	199	179	158
Cameras	8	33	38	42	47	52	56	43	37	39
Musical instruments	35	75	93	112	123	140	172	203	220	216
Furniture	224	685	765	891	1,075	1,352	1,591	1,744	1,963	2,208
Total	641	2,062	2,305	2,567	2,979	3,556	4,191	4,511	4,914	5,386
Index 1968=100	7.0	22.6	25.2	28.1	32.6	39.0	45.9	49.4	53.8	59.0

[In millions of 1968 rubles]

Personal services:										
Household operation	1.184	1.572	1.671	1.779	1.915	2.057	2.214	2.365	2.518	2.673
Communication	.431	.560	.601	.648	.708	.753	.829	.880	.946	1.023
Transportation	1.078	1.712	1.847	2.156	2.400	2.606	2.870	3.100	3.466	3.769
Recreation	.32	.71	.81	.85	.93	.96	.99	1.06	1.08	1.06
Religion	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
Personal care and repair	.38	.56	.60	.61	.62	.77	.89	.95	1.11	1.19
Housing	1.40	1.54	1.58	1.64	1.73	1.83	1.93	2.03	2.11	2.19
Total	4.893	6.754	7.209	7.783	8.403	9.076	9.823	10.485	11.330	12.005
Index 1968=100	27.6	38.1	40.7	43.9	47.4	51.2	55.4	59.2	63.9	67.8
Health and education:										
Health wages	2.389	2.874	2.957	3.063	3.155	3.283	3.461	3.722	3.979	4.205
Health materials	.609	1.304	1.584	1.608	1.669	1.819	1.823	1.953	1.790	1.921
Education wages	2.110	3.781	4.094	4.641	4.905	5.266	5.764	5.969	6.321	6.575
Education materials	.897	1.296	1.396	1.479	1.508	1.628	1.773	1.856	2.064	2.246
Total	6.005	9.255	10.030	10.791	11.237	11.996	12.821	13.501	14.154	14.947
Index 1968=100	29.2	45.0	48.8	52.5	54.6	58.3	62.3	65.6	68.8	72.7

TABLE C-1.—U.S.S.R.: INDEX OF CONSUMPTION—Continued

[In millions of 1968 rubles]

	1964	1965	1966	1967	1968	1969	1970	1971	1972 [1]
Food:									
Animal products:									
Fish	1,676	1,760	1,785	1,878	2,005	2,208	2,316	2,271	2,316
Meat	16,971	19,254	20,609	21,841	22,503	22,576	23,618	25,858	26,453
Staughter fat	2,451	3,249	3,515	3,667	3,572	3,591	3,800	4,218	4,269
Milk	8,332	9,210	10,115	10,909	11,476	11,812	11,977	11,729	11,964
Butter	3,292	3,263	3,533	3,587	3,904	4,229	4,345	4,071	4,307
Cheese	845	953	1,065	1,104	1,187	1,311	1,455	1,407	1,480
Eggs	3,355	3,646	3,976	4,253	4,478	4,662	5,112	5,651	6,050
Processed foods:									
Sugar	5,448	5,958	6,326	6,637	6,760	6,802	7,026	7,272	7,490
Vegetable oil	934	902	851	866	913	944	967	970	980
Margarine	925	904	869	897	958	1,046	1,106	1,214	(1,275)
Confectionery	3,894	3,952	4,360	4,759	5,082	5,567	5,929	6,229	6,603
Alcoholic and soft drinks	14,279	15,560	17,192	19,219	20,758	22,331	23,876	25,588	(27,379)
Canned goods	4,436	4,466	4,780	5,590	5,832	5,896	6,480	6,861	7,273
Macaroni	513	496	493	508	497	543	513	575	(604)
Basic foods:									
Potatoes	5,010	5,152	4,947	4,853	4,901	4,947	4,963	4,932	4,981
Vegetables	5,359	4,828	4,861	5,481	4,990	4,928	5,602	5,437	5,002
Fruits, berries and grapes	1,905	2,501	2,066	2,420	2,942	2,048	2,949	3,261	2,870
Flour and groats	9,192	9,267	9,379	9,379	9,632	9,754	9,904	10,035	10,236
Total	88,817	95,321	100,722	107,848	112,390	115,195	121,968	127,582	131,532
Index 1968=100	79.0	84.8	89.6	96.0	100.0	102.5	108.5	113.5	117.0
Soft goods:									
Cotton cloth	1,846	1,818	1,914	1,993	1,985	1,963	1,822	1,763	1,768
Wool cloth	1,119	1,297	1,307	1,316	1,389	1,403	1,345	1,389	1,401
Silk and rayon cloth	1,301	1,472	1,589	1,634	1,557	1,499	1,530	1,504	1,605
Linen cloth	212	240	271	290	321	334	329	349	356
Sewn goods	8,569	8,591	9,433	10,728	12,396	13,779	15,198	16,140	17,108
Hosiery	1,344	1,469	1,570	1,616	1,595	1,518	1,456	1,424	1,452
Leather shoes	4,319	4,620	4,942	5,244	5,585	5,823	6,207	6,230	6,479
Tobacco	1,764	1,909	2,019	2,198	2,397	2,627	2,780	2,954	3,102
Knitwear	3,851	4,438	4,910	5,329	5,730	6,158	6,534	6,789	7,193
Haberdashery	2,060	2,281	2,500	2,686	2,967	3,284	3,638	4,031	4,434
Total	26,385	28,135	30,455	33,034	35,922	38,388	40,839	42,573	44,898
Index 1968=100	73.5	78.3	84.8	92.0	100.0	106.9	113.7	118.5	125.0

Consumer durables:									
Automobiles	76	69	79	81	93	94	133	239	407
Bicycles and motorcycles	613	688	783	854	902	940	1,007	1,096	1,118
Radios and television sets	1,297	1,520	1,797	1,987	2,247	2,501	2,591	2,416	2,464
Watches and clocks	392	449	472	495	524	538	565	570	581
Electric appliances	756	971	1,201	1,434	1,666	1,868	2,061	2,146	2,247
Sewing machines	146	134	121	103	103	100	103	103	103
Cameras	29	25	35	40	47	46	47	51	(53)
Musical instruments	231	251	269	269	267	268	278	274	(278)
Furniture	2,368	2,595	2,797	2,996	3,280	3,461	3,791	4,225	4,521
Total	5,908	6,702	7,554	8,259	9,129	9,816	10,576	11,120	11,772
Index 1968=100	64.7	73.4	82.7	90.5	100.0	107.5	115.9	121.8	129.0
	[In millions of 1968 rubles]								
Personal services:									
Household operation	2.839	3.021	3.197	3.357	3.611	3.830	4.043	4.261	4.474
Communication	1.113	1.225	1.361	1.505	1.657	1.827	2.004	2.176	2.370
Transportation	4.053	4.382	4.843	5.273	5.760	6.147	6.516	6.927	7.333
Recreation	1.13	1.17	1.15	1.23	1.29	1.28	1.28	1.28	1.34
Religion	.10	.10	.10	.10	.10	.10	.10	.10	.10
Personal care and repair	1.40	1.68	1.95	2.32	2.73	3.13	3.56	3.97	4.435
Housing	2.27	2.34	2.41	2.49	2.57	2.65	2.72	2.80	2.88
Total	12.905	13.918	15.011	16.275	17.718	18.964	20.223	21.514	22.932
Index 1968=100	72.8	78.6	84.7	91.9	100.0	107.0	114.1	121.4	129.4
Health and education:									
Health wages	4.471	4.756	4.969	5.169	5.410	5.605	5.783	5.954	6.168
Health materials	2.036	2.166	2.354	2.369	2.320	2.413	2.700	2.713	2.726
Education wages	6.927	7.601	8.265	9.018	9.770	10.493	11.294	12.066	12.896
Education materials	2.395	2.645	2.872	3.011	3.070	3.312	3.404	3.620	3.849
Total	15.829	17.168	18.460	19.566	20.570	21.822	23.182	24.353	25.640
Index 1968=100	77.0	83.5	89.7	95.1	100.0	106.1	112.7	118.4	124.7

[1] Preliminary.

TABLE C-2.—STRUCTURE OF THE INDEX OF CONSUMPTION

Component and line item	Component weight 1968 [2]	Line item weight [1] 1950 [2]	1960 [2]	1970 [2]	Type of data used to derive: Base weight	Series
Total consumption	100.0					
Food	49.5	100.0	100.0	100.0		
Fish		1.1	1.5	1.9	Retail sales	Deflated retail sales.
Meat		19.9	21.3	19.4	Production	Production.
Slaughter fat		3.0	3.3	3.1	do	Do.
Milk		12.5	10.7	9.8	do	Do.
Butter		3.2	3.7	3.6	do	Do.
Cheese		.4	.7	1.2	do	Do.
Eggs		3.2	4.3	4.2	do	Do.
Sugar		2.9	5.7	5.8	Per capita consumption.[3]	Per capita consumption.
Vegetable oil		.5	.8	.8	Retail sales	Deflated retail sales.
Margarine		.6	.9	.9	Production	Production.
Confectionery		2.6	3.5	4.9	Retail sales	Deflated retail sales.
Alcoholic and soft drinks		9.3	13.8	19.6	do	Do.
Canned goods		1.9	3.8	5.3	Production	Production.
Macaroni		.3	.6	.4	Retail sales	Deflated retail sales.
Potatoes		14.7	6.0	4.1	Per capita consumption.[3]	Per capita consumption.
Vegetables		5.8	5.8	4.6	Production	Production.
Fruits, berries, and grapes		2.2	2.0	2.4	do	Do.
Flour and groats		16.0	11.6	8.1	Per capita consumption.[3]	Per capita consumption.
Soft goods	23.5	100.0	100.0	100.0		
Cotton cloth		16.0	9.5	4.5	Retail sales	Deflated retail sales.
Wool cloth		7.2	6.1	3.3	do	Do.
Silk and rayon cloth		2.9	5.5	3.7	do	Do.
Linen cloth		1.3	1.0	.8	do	Do.
Sewn goods		28.4	33.4	37.2	do	Production.
Hosiery		4.9	4.3	3.6	do	Do.
Leather shoes		17.3	15.3	15.2	do	Do.
Tobacco		7.8	6.2	6.8	do	Deflated retail sales.
Knitwear		9.4	11.7	16.0	do	Production.
Haberdashery		4.8	7.0	8.9	do	Deflated retail sales.
Durable goods	5.0	100.0	100.0	100.0		
Automobiles		3.9	1.6	1.3	Production	Production.
Bicycles and motorcycles		5.0	10.8	9.5	Retail sales	Deflated retail sales.
Radios and television sets		15.9	20.9	24.5	do	Production.
Watches and clocks		22.0	9.1	5.3	do	Deflated retail sales.
Electric appliances		6.2	9.1	19.5	do	Do.
Sewing machines		5.3	5.2	1.0	do	Do.
Cameras		1.2	1.3	.4	do	Production.
Musical instruments		5.5	4.1	2.6	do	Do.
Furniture		34.9	38.0	35.8	do	Retail sales.
Services	10.6	100.0	100.0	100.0		
Household operation		24.2	22.5	20.0	Estimated annual expenditures on heat, water, gas, electricity, kerosene and other fuel.	
Communications		8.8	8.4	9.9	Estimated annual expenditures.	
Transportation		22.0	29.2	32.2	Estimated expenditures on railroad, bus, river, ocean and air transport, on maintaining automobiles, on streetcar, subway, trolley and taxi trips.	
Recreation		6.5	10.1	6.3	Estimated expenditures.	Movie attendance.
Religion		2.0	1.0	.5	National allowance	
Personal care and repair		7.8	9.1	17.6	Estimated expenditures.	Volume of service.
Housing		28.6	19.6	13.4	Stock of housing (living space) priced at the official average rent per square meter.	
Health and education	11.4	100.0	100.0	100.0		
Health wages		39.8	27.0	24.9	Estimated expenditures.	Employment.
Health materials		10.1	14.2	11.6	do	Budget expenditures less investment and wages.
Education wages		35.1	45.0	48.7	do	Employment.
Education materials		14.9	13.8	14.7	do	Budget expenditures less investment and wages.

[1] Appendix Table C-1.
[2] Components may not add to 100 because of rounding.
[3] Multiplied by midyear population for index.

General Notes on Sources

Production, per capita consumption and retail sales data, as well as the price indexes to deflate retail sales data are from the annual Soviet statistical abstract—*Narodnoye khozyaystvo SSSR v ... godu.* Also from the abstract are data on inventory change (wholesale and retail) used to adjust production data. Foreign trade data, also used to adjust production data, are from the annual foreign trade statistical abstract—*Vneshnyaya torgovlya SSSR za ... god. Sovetskaya torgovlya,* Moscow, 1964, added useful information on the distribution of some products within a given line item category.

In order to eliminate double counting of products at different stages of production, the portion further processed is netted out of the quantity available for human consumption. For example, flour and sugar used in confectionery are subtracted from total flour and sugar consumed, adjustment is made for canned foods, and so on. Adjustments are based on sources such as L. V. Opatskiy, *Razmeshcheniye pishchevoy promyshlennosti SSSR,* Moscow, 1958, and V. P. Zotov, ed., *Pishchevaya promyshlennost', SSSR,* Moscow, 1967.

Most of the prices used to value production come from "A Comparison of Consumption in the U.S.S.R. and the U.S.," C.I.A., January 1964, and have been shifted to a 1968 level with the aid of Soviet official price indexes, newspaper reported prices, and Moscow observed prices.

Estimates of annual expenditures on the various services as well as the component weights are made following the procedures used in Morris Bornstein, "Soviet National Accounts for 1955," University of Michigan, 1961, and other Soviet national accounts studies. Budget, employment, investment, and wage data are from the annual statistical abstract, which also supplies much of the data used to estimate the various personal services from communications revenue to subway rides.

HOUSING IN THE SOVIET UNION—BIG PLANS, LITTLE ACTION

By WILLARD S. SMITH

CONTENTS

I. Summary

By Western standards, the Soviet citizen is not well-housed. Notwithstanding some advances in recent years, including increases in the number and size of apartments and improvements in essential services, both the amount and the quality of housing available to the Soviet population are low compared with most other industrialized countries.

Annual allocations to the housing sector have shown a steady increase. However, at the same time the cost of construction has increased and the size of apartments and amount of services provided have also increased, with the result that the number of units completed in a year remains fairly constant. At the present rate of increase in housing stock in urban areas at least six more years will be required to provide each family with its own unit.

Quality of construction by Western standards is shoddy and the designs unimaginative. Moreover, approximately 20% of urban state housing still is without running water and sewerage, and for all housing, rural and urban, this figure probably exceeds 50%. Useful space available per person has increased in the last ten years from about 9 square meters to 11—which is still little more than half that provided in most Western European countries.

This paper reviews the Soviets past performance in housing construction and takes a look at their plans for the immediate future. It must be remembered, however, that statistical comparisons do not necessarily describe a situation accurately. In the final analysis, the extent of the problem depends upon the expectations of the people concerned—if they see improvements, and if these improvements are shared by all, there may not be a problem.

II. The Housing Shortage—Then and Now

There has not been a period during the last 100 years and more that a serious housing shortage has not existed in the area now in-

cluded in the USSR. This has been particularly true in urban areas and the deficiencies have been not only in the amount of space available but in the quality as well. The growth of industrialization in the 50 years prior to the revolution—1860's to 1917—caused a large influx of workers from the countryside to the city. During this period the urban population of European Russia tripled—from 6.1 million to 18.6 million. The dwellings that were available for these workers "did not meet even the most basic sanitary and hygienic requirements." [1] Living conditions in the larger cities of Russia compared most unfavorably with those prevailing in most countries of Western Europe. For example, "comparative statistics of apartment occupancy at the beginning of the twentieth century show that 2.7 persons occupied a Paris apartment, 4 a Berlin apartment, somewhat more than 4 a Vienna apartment, while there were more than 8 persons in a St. Petersburg apartment and 8.7 in a single Moscow apartment.[2]

From 1928 to World War II Soviet investment was largely directed toward industrialization of the country.[3] In addition a large amount of housing was destroyed during World War II. Consequently, at the end of the War the average useful space available per urban resident in the Soviet Union was about 6 sq. m. (65 sq. ft.)—approximately one sq. m. less per person than in the prerevolutionary period 1912–1914.[4] By the end of 1971, however, the average had reached about 11 sq. m. (118 sq. ft.)—(see Table 1).[5] Although the figures in Table 1 indicate a substantial improvement in space availability in the USSR, they still compare unfavorably with most European countries. For example, the 1971 housing census in East Germany[6] indicates that the average space per person is 20.8 sq. m. (224 sq. ft.). Most Western European countries average 20 sq. m. or more. The United States average is at least 25 sq. m. (270 sq. ft.).

Not only has the average amount of housing space per capita increased since 1913 but the distribution is more equitable. In contrast to 1913, the working man today may be living next door to his plant manager. However, there are still geographic differences. For example, the per capita urban housing space in Latvia is over 14 sq. m. whereas in Uzbekistan it is only slightly over 8 sq. m. (see statistical appendix, Table 13 for details). Generally the European part of the country averages much better than the central Asian area.[7]

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[1] T. Sosnovy, *The Housing Problem in the Soviet Union,* Research Program on the USSR, New York, 1954, p. 1.

[2] *Ibid.*, p. 3–4.

[3] See Table 17 p. — for comparison of percent of investment in housing over time.

[4] For the purposes of this article, data on space available or space provided refers to "useful space" unless otherwise identified. *Useful space* includes living rooms, bedrooms, kitchens, baths, interior halls and closets, but excludes external halls, stairways and elevator shafts common to more than one unit and the space occupied by walls. *Living space* refers to living rooms and bedrooms only and for urban areas is assumed to be ⅔ of useful space and in rural areas ¾ of useful space. Nine sq. m. of living space per person is generally recognized as a minimum sanitary standard. US housing statistics are generally reported as an overall measure which includes walls, corridors and stairs used in common. Useful space is roughly equivalent to 80% of overall space.

[5] See Statistical Appendix for other tables.

[6] JPRS 57579, 22 Nov 72, p. 11, translated from *Statistische Praxis,* East Berlin, Sep 72, pp. 371–376.

[7] Central Asian Republics have higher than average birthrates and larger families. In addition, Uzbekistan is still recovering from the series of earthquakes in 1966 which caused widespread destruction of housing.

TABLE I.—U.S.S.R.: AVERAGE HOUSING SPACE PER PERSON SELECTED YEARS, 1913–71

[Square meters useful space]

End year	Urban	Rural	Total	End year	Urban	Rural	Total
1913	7.3			1961	9.1	8.6	8.9
1922	8.4			1962	9.4	8.8	9.1
1926	8.2			1963	9.6	9.0	9.3
1940	6.5			1964	9.8	9.2	9.5
1950	7.0	6.5	6.7	1965	10.0	9.4	9.7
1955	7.4	7.1	7.3	1966	10.2	9.7	9.9
1956	7.7	7.2	7.4	1967	10.4	9.9	10.2
1957	8.0	7.4	7.7	1968	10.6	10.1	10.4
1958	8.3	7.6	8.0	1969	10.8	10.3	10.6
1959	8.6	8.0	8.3	1970	11.0	10.5	10.8
1960	8.9	8.4	8.6	1971	11.2	10.7	11.0

Source: Table 12, statistical appendix.

Two factors combine to create the low per capita space in the Soviet Union. One is the size of the apartment units which remains small by European and American standards, the other is the number of occupants per apartment. Because of the backlog of demand, many apartments are occupied by more than one family. A statement made in mid-1969 by L. I. Brezhnev, First Secretary of the Communist Party, USSR indicates the widespread sharing of apartments and the rising expectations of the Soviet people regarding housing:

* * * the housing problem remains very acute. Why? The point is that as a rule, by today's standards it is no longer simply a question of housing space but of separate apartments with all conveniences for every family . . . .

Older communal apartments are gradually being converted to individual apartments. A recent Soviet article discussing housing construction in the current five year plan (1971–1975) indicates that by 1975, 75% of the people living in urban state housing (the socialized sector) will be in single family apartments—compared to 40% in 1960.[8]

The average waiting period for a person seeking an apartment in the Soviet Union ranges from 1½ to 3 years.[9] At Bratsk in East Siberia the wait is even longer—four to five years. Because rental charges are nominal—about 5% of wage incomes—and, therefore, heavily subsidized—almost everyone can "afford" more housing. However, as the supply of housing is limited the low rents create the usual problems of rationing. Among the things which are taken into consideration in making allocations are: the degree of need for housing, seniority, and "socially useful" activity.

During the past 12 years the number of housing units available per thousand population in the USSR has increased more than 20% overall and almost 30% in urban areas (see Table 2). However, they still lag considerably behind European countries and at present construction rates will require at least 6 more years to reach the goal of separate housing for each family (see Table 3). Estimates of number of apart-

[8] N. Bobrovnikov, *Voprosy Ekonomiki,* No. 5. May 72, p. 24. (Translated in JPRS 56536, 19 Jul 72, p. 22.)

[9] Three years, however, is certainly not the maximum waiting period. According to an article in *Pravda,* one woman in Smolensk complained that she and her five children have been on the waiting list for an apartment for 12 years. The family is crowded into 15 sq. m. without communal conveniences or even a kitchen. *The Current Digest of the Soviet Press,* Vol. XXIV, No. 48, 27 Dec 72, p. 7. (Translated from *Pravda,* 29 Nov 72).

ments per thousand population, moreover, do not indicate the number of families which are provided with separate apartments because no distinction is made between communal apartments with shared kitchens and baths and separate apartments with their own kitchen and bath facilities. In any case, the data indicate a continued shortage of housing units in urban areas.

URBAN HOUSING PER THOUSAND POPULATION

	Average family size	Housing needed per 1,000 population [1]	Housing available per 1,000 population	Shortage [2]	
				Units	Percent
1959	3.5	286	199	87	30
1971	3.5	286	258	28	10

[1] Housing needed to furnish each family with a separate apartment, calculated by dividing 1,000 by average size of family.

[2] Shortage is difference between available and needed. These data do not take deterioration or decrepitude of stock into account.

TABLE 2.—U.S.S.R.: STOCK OF HOUSING UNITS PER THOUSAND POPULATION, URBAN AND RURAL,[1] 1959–1971

End Year	Urban	Rural	Total	End Year	Urban	Rural	Total
1959	198.8	242.6	221.3	1966	236.4	274.9	254.1
1960	204.6	250.8	227.7	1967	241.7	278.4	258.3
1961	211.2	255.6	233.2	1968	246.3	281.5	261.9
1962	217.5	259.8	238.1	1969	250.3	284.7	265.4
1963	222.9	264.2	242.7	1970	254.4	287.2	268.5
1964	227.6	267.5	246.6	1971	257.9	289.8	271.4
1965	232.7	270.8	250.5				

[1] The 1971 average size of Soviet families is: urban, 3.5 members and rural, 3.7 members.

Source: Estimated. See methodological appendix.

TABLE 3.—SELECTED COUNTRIES: COMPARISON OF STOCK OF HOUSING UNITS, 1963 AND 1971

	Units per thousand population		Percentage change
	1963	1971	
U.S.S.R.	242.7	271.4	11.8
Eastern European countries:			
Czechoslovakia	288.3	[1] 311.8	8.2
East Germany	335.5	353.9	5.5
Hungary	292.4	313.4	7.2
Poland		258.8	
Yugoslavia	232.9	248.6	6.7
Western European countries:			
Austria	329.1	366.1	11.2
Belgium	346.7	[1] 370.1	6.7
Cyprus	284.6	300.0	5.4
Denmark		375.7	
West Germany	308.8	348.9	13.0
Finland	283.4	321.0	13.3
France	344.3	[1] 320.4	−6.9
Ireland		245.2	
Italy	233.6	323.3	10.1
Malta	243.9	285.5	17.1
Netherlands	255.0	294.3	15.4
Spain	292.6	318.7	8.9
Switzerland	297.7	344.6	15.8
Great Britain	321.1	348.7	8.6
United States		[1] 338.0	
Japan	219.3	[1] 273.2	24.6

[1] 1970.

Source: United Nations, "Annual Bulletin of Housing and Building Statistics for Europe, 1971," New York 1972, pp. 13–39. Except: U.S.S.R., table 2. United States, "1970 Census of Housing, General Housing Characteristics, United States Summary," U.S. Department of Commerce, HC(1)A–1, December 1971, pp. 1–8. Japan, "Japan Statistical Yearbook 1971," p. 11 and 436–437. (1970 extrapolated from 1968 data using new construction and removals.)

By contrast there is an apparent oversupply of rural houses, caused no doubt by the continued movement of people from rural to urban areas and to some extent by the second houses of some of the privileged classes, that is, the country "dachas" owned or assigned to certain government officials, writers, and others. In addition, there are indications that some farm families prefer to remain in their "huts" near their private plot rather than move into newly constructed "urban type" apartments.[10]

RURAL HOUSING PER THOUSAND POPULATION

	Average family size	Needed [1]	Available	Shortage [2]	
				Units	Percent
1959	3.9	256	243	13	5
1971	3.7	270	290	+20	+7

[1] Housing needed to furnish each family with a separate apartment, calculated by dividing 1,000 by average size of family.
[2] Shortage is difference between available and needed; + indicates an excess of available over needed. These data do not take deterioration or decrepitude of stock into account.

III. New Construction

How Much?

The Soviets claim that they are building more housing than any other country in the world. This is true if only the numbers of units is considered, and not the volume or floor area. The number of units built in the Soviet Union has exceeded two million every year beginning with 1957. The peak number was reached in 1959 at just over 2.7 million units (see Table 4). Although construction has declined since then, during the last several years it has averaged over 2.2 million units—compared with an average of 1.4 million units annually for the same period in the United States. When considered with respect to population size, however, at least ten Western European countries as well as Japan are now (1971) producing more units than the USSR (see Table 5). This is a dramatic change from earlier years (1963) when only Sweden was producing more units per thousand population than the Soviet Union.

Based upon area of housing built annually per thousand population the situation in the USSR today is less favorable than in any Western European country for which data are reported, Japan or the United States (see Table 5). The area of housing constructed annually in the USSR, as well as the number of units, peaked in 1959 at over 115 million sq. m. This amount has not been reached since that year and the increasing population has caused a decrease in the area constructed annually per thousand population while in nearly all other major countries, including those of Eastern Europe, the trend has been upward.

[10] V. Stern, *Voprosy Ekonomiki*, No. 11, Nov 70, pp. 94–104. (Translated in JPRS 52131, 8 Jan 71, p. 25 and 36.)

TABLE 4.—U.S.S.R.: AREA, NUMBER, AND AVERAGE SIZE OF HOUSING UNITS BUILT, 1950–71

Year	Useful area (million square meters)	Units (thousands)	Average size (square meters)	Year	Useful area (million square meters)	Units (thousands)	Average size (square meters)
1950	40.4	1,073	37.7	1963	97.6	2,322	42.0
1951–55 (annual average)	48.1	1,210	39.7	1964	92.7	2,184	42.4
1956	63.1	1,548	40.8	1965	97.6	2,227	43.8
1957	85.9	2,060	41.7	1966	102.1	2,291	44.6
1958	100.3	2,382	42.1	1967	104.5	2,312	45.2
1959	115.2	2,711	42.5	1968	102.1	2,233	45.7
1960	109.6	2,591	42.3	1969	103.8	2,231	46.5
1961	102.7	2,435	42.2	1970	106.0	2,266	46.8
1962	100.0	2,383	42.0	1971	107.6	2,256	47.7

Source: Table 15, statistical appendix.

TABLE 5.—SELECTED COUNTRIES: NUMBER OF HOUSING UNITS AND AREA BUILT ANNUALLY PER THOUSAND POPULATION, 1963 AND 1971

	Number of units		Useful space in square meters	
	1963	1971	1963	1971
U.S.S.R.	10.2	9.2	431	439
Eastern European countries:				
Bulgaria	5.4	5.7	326	369
Czechoslovakia	6.5	7.6	385	529
East Germany	4.5	5.1	----------	----------
Hungary	5.2	7.3	312	458
Poland	4.6	5.8	238	324
Romania	6.5	7.3	300	346
Yugoslavia	5.8	6.1	291	368
Western European countries:				
Austria	6.6	6.0	471	480
Belgium	4.3	[1] 4.8	----------	----------
Denmark	7.1	10.1	547	921
West Germany	9.9	9.1	744	770
Finland	9.7	10.8	572	753
France	7.0	9.5	494	730
Greece	6.2	14.0	----------	----------
Iceland	6.8	6.7	----------	----------
Ireland	2.6	5.1	----------	449
Italy	8.2	6.7	----------	----------
Malta	5.5	10.3	----------	----------
Netherlands	6.7	10.4	----------	----------
Norway	7.9	9.8	611	[1] 853
Spain	6.6	9.3	419	705
Sweden	10.7	13.2	762	1,044
Switzerland	9.5	10.7	----------	----------
Great Britain	5.9	6.7	----------	----------
United States	----------	8.3	----------	764
Japan	4.5	13.9	[2] 266	[1] 947

[1] 1970.
[2] 1965.

Source: United Nations, "Annual Bulletin of Housing and Building Statistics for Europe, 1971," New York, 1972, p. 13–39. Except: U.S.S.R.–1971, "Narodnoye Khozyaystvo SSSR, 1922–72," Moscow, 1972, p. 93. Japan—"Japan Statistical Yearbook 1971," pp. 228 and 11. 1971 figure from "Japan Economic Yearbook 1972," the Oriental Economist, p. 219. Square meters calculated from units and average size given in table 6.

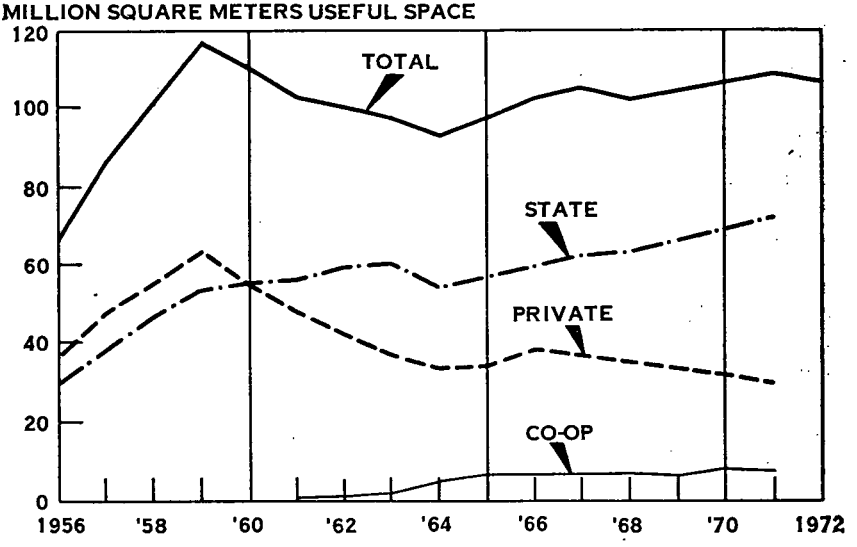
By Whom?

Housing constructed in the Soviet Union is divided into three major categories based on ownership—State and State Enterprises, Housing Construction Cooperatives, and private sector [11] (See Figure 1

[11] Private sector consists of housing built by wage and salary workers (workers) in small cities and in rural areas and housing built by collective farmers and, what are officially designated as "rural intelligentsia"—teachers, agronomists and similar professionals connected with collective farms. In addition, a small amount of housing built by the collective farms as an entity are included in recent years.

FIGURE 1.

USSR: Annual Area of Construction of Housing, by Category of Owner



and Table 14 of the Statistical Appendix). The relative importance of the several categories of owners in housing construction is shown by the following tabulation:

PERCENT OF TOTAL USEFUL SPACE CONSTRUCTED

Year	State	Co-op	Private
1956-59	46	0	54
1964	58	5	37
1971	67	6	27

The category state and state enterprises (state) is made up of many different governmental related organizations—local councils, ministries and departments of the republics, union republic ministries, union ministries, and enterprises under their direction. The funds come from both central budgets and from the enterprises' own funds. For example, part of the profits of enterprises are earmarked for housing construction. The share of housing built by the state increases from less than one-half of the total in 1956 to over two-thirds.

Housing constructed by the state is mostly multi-story apartments, as shown in the following table (expressed in percent of total) :[12]

[12] *Voprosy Ekonomiki*, No. 5, May 72, p. 27. (Translated in JPRS 56,536, 19 Jul 72, p. 26.)

Year	1 to 2 stories	3 to 4 stories	5 stories	6 to 9 stories	Over 9 stories
1961	23.0	33.0	43.0	1.0	----
1965	13.1	14.0	67.4	4.7	0.8
1970	13.7	8.7	58.7	16.2	2.7

As recently as 1965 only 5.5% of the housing built by the state was over five stories but by 1970 had reached almost 19%. The five-story walk-up, however, remains the standard.

A housing construction cooperative (coop) is an association composed of a number of Soviet citizens, at least 18 years of age, permanent residents of a given locality, and "in need of improved living conditions." It is organized under the executive committee of the local council and is granted a charter.

A down-payment of 40% (30% under certain conditions) of the cost of the apartment must be made and the balance paid in equal shares over 10 to 20 years. The annual interest charge is one-half of one percent. Although the individual pays for construction of coop housing he only acquires the privilege of occupying an apartment, ownership of the building remains with the coop. For statistical purposes housing constructed by coops is often combined with that built by the State. Both are considered part of the socialized sector.

Construction of housing by coops began in the early 1960's, increased rapidly to over 6.5 million sq. m. built in 1965 and has remained at about that level since. Construction is performed by the same construction organizations that build state housing and competes with state housing for land, labor, machines, and materials. Coop housing construction tends to go slowly because it is given the lowest priority by construction organizations. In 1968 this tendency to downgrade coops was greatly reinforced by a resolution which provided 10% of the state housing built by the contractor for the contractor's workers but nothing at all from coop construction. Furthermore, slowness in the formation of coops and construction of coop housing reduces the incentive for Soviet families to join them. The primary reason for joining is expectation that the family will receive separate housing sooner than it would by waiting for state housing. Because of the long delays however, only the families near the bottom of the state list, for example, young newly married couples crowded into their parents' apartments, can get housing much sooner through the coop than by waiting their turn on the state list.

Moreover, the cost of coop housing to the individual is substantial. The initial investment of state housing comes out of government or enterprise budgets and is not recovered through rental charges. In fact, rental payments are reported to cover only about 36% of current upkeep and repair.[13] Coop housing on the other hand requires a down-payment of about 2,500 rubles and monthly payments of over 20 rubles for 15 years to pay for the full cost of construction of an av-

[13] The rental charge averages 1.46 rubles per sq. m. of living space or about 44 rubles a year for an average size (30 sq. m. of living space) apartment—less than 4 rubles per month. Cost of current upkeep and repair, however, average 4.05 rubles per square meter of living space per year—or a little over 10 rubles per month for an average size unit. I. N. Shutov, *Lichnoye potrebleniye pri sotsializmye*, Moscow, 1972, p. 170.

erage size apartment. In addition, the coop members must pay for the upkeep and repair of the building—another 10 rubles per month.

In 1965 when construction of coops was still increasing rapidly from year to year, officials of the Moscow Office of the Construction Bank asserted that if conditions were liberalized for the USSR as a whole, the share of housing built by coops would increase to at least 50% of the total.[14] Coop construction is particularly attractive to the regime because it is a useful vehicle for reducing inflationary pressure by drawing off excess purchasing power. The Eighth Five Year Plan (1966–1970) called for 52 million sq. m. of housing to be built by Coops. Instead, only 33.5 million sq. m. were built—less than two-thirds of the amount expected.

A third category of housing is that built by the private sector. These are mostly single family or duplex houses built in smaller cities and rural areas by wage and salary employees (workers) and on collective farms by collective farmers and rural intelligentsia.[15]

The area of housing built by the private sector has declined dramatically from a peak of 61.7 million sq. m. in 1959—more than 53% of the total—to 28.9 million sq. m. in 1971—less than 27% of the total. Despite the large role private builders played in housing construction, the official attitude toward this activity was somewhat restrictive in the early 1960's. In 1965 a shift in emphasis, if not in policy, was discernable and the decline in private construction temporarily halted. However, although the Government, as a practical consideration, adopted the position that houses are personal property and not private and therefore are legally recognized, the decline in private housing construction resumed after 1966. Although the downturn in individual home building may possibly be a reflection of deliberate restrictive policies, it is more likely the outcome of an increasingly stringent problem in providing building materials. Although the 1971–75 plan directives state that it is necessary "to assist individual housing construction," and plan goals were set well above the level attained in 1970, actual construction of private housing continued to decline through 1972.

Where? Urban vs Rural

The urban population in the Soviet Union has been expanding rapidly. Since 1960 the urban population has increased more than 32% and the rural population has decreased more than 4%. Despite the fact that the rural population is actually decreasing in magnitude, almost one-third of all housing built in the Soviet Union in recent years is in rural areas (see Figure 2).

Between 80 and 90% of all state and coop housing is constructed in urban areas—this accounts for more than 90% of total urban construction. More than 20% of private housing is built in urban areas but because of its relatively smaller volume it now amounts to less than 10% of total urban construction—a decline from 30% in 1956. State and coop construction as a percentage of total has been gradually increasing

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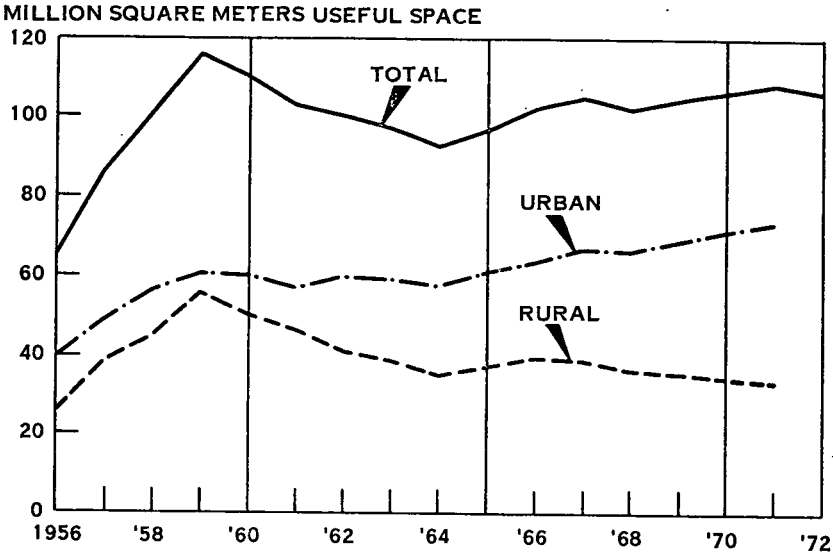
[14] *Ekonomicheskaya Gazeta,* 24 Feb 65, p. 12. Major points of liberalization suggested were decreasing down payments to 27 to 30% and increasing period of repayment of the loan to 20 to 25 years.

[15] In recent years the collective farms themselves have built some housing. Although not really private construction, they are classified as such because we do not have sufficient information to break them out.

in both urban and rural construction—from 70% in 1956 to 92% in 1971 in the case of urban housing and from 12% to 34% in the case of rural construction for the same years.

FIGURE 2.

USSR: Construction of Housing, by Area, Urban and Rural



Unit Size

Soviet housing units are small not only in comparison with those of the United States, but also in comparison with those of most European countries and Japan (see Table 6). Of the countries for which data are readily available, only Romania in Eastern Europe is building housing units as small as those built in the USSR. Other Eastern European countries are building units up to 46% larger and Western European countries up to 91% larger. Japanese units average 43% larger.

The size of the average housing unit in the Soviet Union increased by about 13% during the ten year period 1961–1971, going from 42.2 sq. m. to 47.7 sq m. The increase in size of units built by the State and Coops, however, was less favorable being only about 10% for that period, whereas units built by the private sector increased by 29% to an average size of 56.6 sq. m. (see Table 7). Plans for the 1970s which are now being implemented on a gradual basis will increase the size of state and coop housing an additional 16% over the 1971 size bringing them to an average of 52.5 sq. m.—still well below those of any Western European country.

TABLE 6.—SELECTED COUNTRIES: AVERAGE SIZE OF HOUSING UNITS BUILT IN 1963 AND 1971

[Square meters useful space]

	1963	1971
U.S.S.R.	42.0	47.7
Eastern European countries:		
Bulgaria	60.3	64.7
Czechoslovakia	59.3	69.6
Hungary	60.0	62.7
Poland	51.8	55.8
Romania	46.2	47.4
Yugoslavia	50.1	60.4
Western European countries:		
Austria	71.4	80.0
Denmark	[1] 77.0	[1] 91.2
West Germany	75.2	84.6
Finland	59.0	69.7
France	70.5	76.8
Ireland		88.0
Norway	77.3	[2] 87.0
Spain	63.5	75.8
Sweden	71.2	79.1
United States		92.0
Japan	[3] 59.0	[2] 68.1

[1] Area given in source reduced 20 percent to convert from overall area to useful area.
[2] 1970.
[3] 1965.

Source: United Nations, "Annual Bulletin of Housing and Building Statistics for Europe, 1971," New York, 1972, pp. 13–39. Except: U.S.S.R.—table 15, Statistical Appendix, United States—estimated. Based on average completions as presented in "Construction Review," U.S. Department of Commerce, October 1972, p. 17, and average floorspace of residential buildings contracted as presented in "Statistical Abstract of the United States, 1972," p. 678. The U.S. figures were reduced 20 percent to convert to useful space and then converted to square meters. Japan—"Japan Statistical Yearbook, 1971," pp. 228–229.

TABLE 7.—U.S.S.R.: AVERAGE SIZE OF HOUSING UNITS CONSTRUCTED BY CATEGORY OF OWNER 1950–71

[Square meters useful space]

Year	Total	State and co-ops	Private sector	Year	Total	State and co-ops	Private sector
1950	37.7	43.2	34.2	1963	42.0	40.7	44.6
1951–55 (annual average)	39.7	43.5	36.9	1964	42.4	41.1	44.9
1956	40.8	44.8	37.8	1965	43.8	41.8	48.0
1957	41.7	44.9	39.4	1966	44.6	41.9	50.5
1958	42.1	44.3	40.4	1967	45.2	42.8	50.6
1959	42.5	43.2	41.9	1968	45.7	43.2	52.1
1960	42.3	42.3	42.3	1969	46.5	44.0	53.5
1961	42.2	40.9	43.8	1970	46.8	44.5	54.1
1962	42.0	40.7	44.1	1971	47.7	45.1	56.6

Source: Table 15, statistical appendix.

Quality

Many factors combine to determine the quality of housing, i. e., the degree to which the housing satisfies the needs and desires of the occupants. Amount of space is of course one of these, and as noted earlier, apartment sizes are slowly increasing. Degree of privacy afforded is also important and this too is improving as the trend is towards less use of communal facilities, and more apartments with four and five rooms for larger families—but the progress is slow. Of equal importance is the presence, or absence, of service facilities (stores, schools, transportation) and conveniences or amenities within the apartment, such as: water, sewerage, central heat, and hot water. Quality, at least to the Western observer, would also include appearance, ability to keep out the cold, the heat and the rain and durability.

By any standard of comparison the quality of Soviet housing is not high.

During the push to build more housing for the Soviet people in the late 1950's so-called "economical" plans were adopted. The pressure was for quantity rather than quality. Inhabitants of homes built in 1960–1962 frequently complained about the inconveniently planned apartments, the plumbing arrangement, entrances, narrow corridors, lack of utility rooms, leaking walls and penetration of cold weather.[16] In the mid-sixties new improved plans were developed, but the government was only partially successful in having them adopted. Now another set of new standardized plans—some six hundred in number—have been drawn up. These plans take into account composition of families, increased area for kitchens, entries, and space for family equipment and possessions, and different climatic conditions. There are ten apartment models ranging from one-room apartments for one person to five-room apartments for families of seven or more (see Table 8) and space is provided in the building for storing bicycles, baby carriages and similar equipment. However, as in previous years when improved plans were prepared, it is not expected that they will be quickly adopted by all sectors—in fact, the current Five Year Plan indicates that by the end of 1975 only approximately 25–30 percent of the new designs will have been introduced.

TABLE 8.—U.S.S.R.: REVISED STATE PLANNING NORMS FOR URBAN APARTMENTS

Family	Number of rooms and type apartment [1]	Maximum useful area (square meters)	Minimum living area (square meters)
Size and composition:			
1	1A	28	12
2 Couple; mother and daughter; father and son	1B	36	18
2 Mother and grown son; father and grown daughter; adults—opposite sexes	2A	41	23
3 Not specified	2B	48	27
4 Not specified	3A	58	36
5 Parents and small children	3B	63	38
5 Parents and grown children	4A	70	46
6 Not specified	4B	74	48
7 Not specified	5A	84	56
7 or more	5B	91	58

[1] Living and sleeping rooms—does not count kitchens, baths or other auxiliary space. Type A—smaller rooms, type B—larger rooms.

Source: B. Rubanenko and D. Meyerson, "Arkhitektura S.S.S.R," No. 3, March 1972, pp. 14–17. Translated in JPRS 55955, May 10, 1972, pp. 25–26.

If the current five year plan is fulfilled, 20 percent of the urban state sector of housing still will lack running water and sewerage, 30 percent baths or showers, and 50 percent hot water. This would be a modest improvement, however, over current conditions (see Table 9). The state sector does not include housing owned by individuals—almost 30 percent of the urban housing fund. If statistics for this sector were included the picture would be less favorable. Inclusion of rural areas—40 percent of the total housing stock—would further reduce the share of housing provided with basic amenities. For all housing in the Soviet Union the percentage is probably little more

[16] *Izvestiya*, 28 Nov 67, p. 3.

than half the percentages shown for the urban socialized sector. In Moscow the situation is significantly better than in most urban areas, however, even there 16 percent of the public housing did not have baths or showers in 1970 and 37 percent did not have hot water. By contrast in the United States over 93 percent of *all* year round housing had all plumbing facilities in 1970, over 95 percent had hot and cold running water and less than 2.5 percent had no running water.[17]

TABLE 9.—U.S.S.R.: PERCENTAGE OF URBAN STATE HOUSING STOCK SUPPLIED WITH AMENITIES

	U.S.S.R. 1959 [1]	Moscow 1970 [2]	U.S.S.R. 1971 [3]	U.S.S.R. plan 1975 [4]
Running water	56	99	78	80
Sewerage	53	99	73	80
Central heat	44	97	----	[1] 78
Baths or showers	30	84	65	70
Hot water	----	63	----	50

[1] N. Bobrovnikov, "Voprosy Ekonomiki," No. 5, May 1972, p. 25.
[2] "Moskva v Tsifrakh, 1972," p. 105.
[3] I. Ivanov, "Zhilishchnoye i Kommunal 'noye Khozyaystvo," No. 12, December 1972, p. 9.
[4] JPRS 56970-2, "State 5-Year Plan for the Development of the U.S.S.R. National Economy for the Period 1971-75," Part II, Sept. 7, 1972. p. 321.

Dwellers in newly constructed housing areas in the Soviet Union are frequently inconvenienced over a long period of time by lack of public services. Practical experience indicates that occupancy of new housing areas, as a rule, is one or two years ahead of the appearance of the first trade enterprises, public catering and children's establishments. Northwest Chelyabinsk, for example, in early 1969 had more than 10,000 residents but did not have a movie theater, service establishment, public dining room, store, or kindergarten.[18] Complaints by Soviet citizens of similar situations are constantly being reported in the Soviet press.

Soviet housing—particularly large urban projects—enjoys a reputation for uniformity—uniformly unattractive in design and shoddy in construction. Priority is given to demand for shelter now—quantity before quality. Bonuses and evaluations of managers are based on quantity produced. The year end rush to complete the plan contributes to poor quality because: the workers lack time to do a good job, climatic conditions are unfavorable, and supervisors and commissions are willing to accept incomplete or poorly finished structures in order to make production quantities look good. A chronic shortage of skilled workers persists in the USSR and construction has tended to be the entry point for unskilled farmers and youth into the industrial labor force. Once trained, workers tend to leave construction for more desirable employment. In addition, within the construction industry itself, housing tends to get the lower skilled workers. Finally the system rewards volume rather than quality workmanship which leads to slipshod labor practices and lack of pride in accomplishment.

[17] United States—1970 Census of Housing, *General Housing, Characteristics—United States Summary*, US Department of Commerce. HC(1)A-1, Dec 71. p. 1-16.
[18] *The Current Digest of the Soviet Press*, Vol. XXI, No. 36, 1 Oct 69, p. 26. (Translated from *Pravda*, 8 Sep 69, p. 2).

Cost

The construction cost of housing built by the state increased from 116 rubles per sq. meter (r/sq. m.) in 1963 to 151 r/sq. m. in 1971[19]—an increase of 30% (see Table 10). This increase is partially explained by improved design and additional amenities and partially by the increased costs for utilities and service facilities incurred in the opening of new areas. The cost of individual housing is approximately one-half that of state housing—due in part to the lower level of amenities in non-state housing as well as the cheaper, less durable materials used in construction.

TABLE 10.—U.S.S.R: RUBLE COST PER SQUARE METER OF USEFUL HOUSING SPACE[1] 1956–75

	State and co-op[2]	Private sector[3]		State and co-op[2]	Private sector[3]
1956	121	56	1966	133	64
1957	130	54	1967	138	68
1958	126	61	1968	147	71
1959	120	61	1969	145	71
1960	120	63	1970	148	71
1961	119	64	1971	151	76
1962	116	64	Plan 1972	149	78
1963	116	63	Plan 1973	150	79
1964	118	62	Plan 1974	151	79
1965	123	66	Plan 1975	152	79

[1] In construction prices effective Jan. 1, 1963. Costs were calculated by dividing investment by square meters completed during the year. Therefore, because of differences in carry over from year to year, the annual figures are approximations and year-to-year fluctuations are probably not significant. Trends, however, are shown.

[2] These figures include some expenditures for utilities, trade, and public service enterprises built in the new housing regions. These expenditures may total as much as 20 percent.

[3] Investment by individuals recalculated to reflect higher construction costs introduced Jan. 1, 1969.

Source: Table 16, statistical appendix.

IV. Capital Investment[20]

During the period 1962–71 average annual investment in housing construction increased at a fairly uniform rate, of 3.8% per year, going from approximately 9.7 billion rubles in 1961 to 14.1 billion in 1971. This increased annual investment did not, however, result in more housing units being constructed as might be expected because it was matched by a rise in cost per square meter and an increase in average apartment size which completely absorbed the increased investment. A more significant indicator of the priority attached to housing construction might be in the percentage of total capital investment that the Soviets assign to housing construction. During the same ten year period this percentage declined from about 22% to 16%. Allocations established for the current five year plan indicate that this decline will continue through 1975 (see Table 11).

[19] Roughly equivalent to $28 per sq. ft. for similar construction in the United States at 1971 prices.

[20] Published Soviet statistics understate investment in housing by individuals. Data in 1969 prices published in *Narodnoye Khozyaystvo v 1970* for housing investment by the state and collective farms shows an upward adjustment of about 24% over data in 1955 prices which were published in earlier *Narkhozes*. Investment by individuals, however, was not changed to reflect the higher 1969 construction costs. In this paper the capital investment by individuals as reported by the Soviets has been increased 24% and the ruble amount of the increase has been added to total investment.

TABLE 11.—U.S.S.R.: CAPITAL INVESTMENT IN HOUSING AND AS A PERCENT OF TOTAL CAPITAL INVESTMENT 1956-75

Year	Capital investment (billions of rubles)	Share of total investment (percent)	Year	Capital investment (billions of rubles)	Share of total investment (percent)
1956	5.4	20	1966	11.1	18
1957	7.6	25	1967	11.9	18
1958	9.2	26	1968	12.5	17
1959	10.2	26	1969	12.7	17
1960	10.1	24	1970	13.5	16
1961	9.7	22	1971	14.1	16
1962	9.5	20	1972 plan	14.6	16
1963	9.4	19	1973 plan	14.8	15
1964	9.1	17	1974 plan	15.0	14
1965	10.1	18	1975 plan	15.2	13

Source: Table 17, statistical appendix.

V. Future Prospects

As noted previously, the new apartment designs which will come into more general use during this decade will provide more space per apartment and more per person and will generally provide most of the essential amenities. However, indications are that there will be little or no increase in the numbers of units built annually or the numbers of persons provided with housing.

The Soviets continue to experience major problems with their industralized construction techniques. The use of large pre-cast, factory made units has not been the great panacea that was predicted at the time it was introduced in large scale in the early 1960's. It has not eliminated construction problems, in fact it has created many of its own—such as bottlenecks in production, delayed deliveries, lack of flexibility and high capital investment. Most important, it has not increased the rate of construction significantly and has not resulted in any noticeable cost economy.

The plan goals of the current five year plan and the results obtained during the first two years of this plan indicate that for the next several years there will be no significant change from the trends established during the decade of the 60's, i.e., modest increases in size of units, modest improvement in quality, but little or no increase in the numbers of people to benefit annually from improved housing.

Methodological and Statistical Appendixes

Methodological Appendix

USSR: Stock of Housing

The USSR publishes data on the urban stock of housing in terms of square meters. Data on the rural stock in any form and the urban stock in terms of number of units, however, are largely unavailable. The data used in this report were derived as follows:

Rural Stock—Square Meters

The stock of housing in rural areas was estimated to be 872 million sq. m. at the end of 1959. This is based on a Soviet report which states that the living space per rural inhabitant was 6 sq. m. and the rural population was 109 million persons.[1] Assuming living space averages 75% of useful space in rural houses the total useful space is 6÷.75 x 109 million=872 million sq. m.

Accepting 872 million sq. m. as the rural stock at the end of 1959, the stock for years before and after that were calculated using the following data: new construction, transfers of rural housing to urban areas and housing destroyed for any reason— abandonment, fire, torn down to make way for new roads, dams, industries, and the like. Transfers to urban stock for 1959 on are given in *Narkhoz 65*, p. 616 and *Narkhoz 72*, p. 367. Transfers for prior years are estimated, based on growth of the urban fund. During the 1950's little rural housing would have been voluntarily abandoned and destruction for all reasons is estimated to have averaged 0.5% per year. By 1960, however, the critical shortage caused by World War II destruction had been alleviated and rural housing torn down or abandoned is believed to have increased. Moreover, in rural areas, where population is declining, where much of the housing built after World War II is of low quality and durability, and where an effort is being made to move farmers from outlying areas to central villages, the abandonment or destruction rate is believed to be increasing more rapidly than in urban areas. Therefore, a destruction rate of 0.75% has been assumed for 1960, 1.0% for 1961 and an annual increase after that of 0.1% per year to 2.0% in 1971.

CALCULATION OF RURAL STOCK

[In millions of square meters of useful space]

End year	New construction	Transfer to urban	Destroyed	Stock at end of year
1950				708
1951-55	104.0	[1] 12.0	18.0	
1955				782
1956	25.1	[1] 10.0	3.9	793
1957	37.8	[1] 18.0	4.0	809
1958	44.6	[1] 18.0	4.0	832
1959	55.8	11.3	4.2	872
1960	50.6	9.1	6.5	907
1961	46.6	7.8	9.1	937
1962	41.1	5.4	10.3	962
1963	39.2	5.0	11.5	985
1964	35.2	3.6	12.8	1,004
1965	36.9	5.9	14.1	1,021
1966	38.7	2.9	15.3	1,042
1967	38.4	3.1	16.7	1,061
1968	36.0	3.8	18.0	1,079
1969	35.2	1.4	19.4	1,089
1970	34.7	1.6	20.7	1,101
1971	34.7	2.8	22.0	1,111

[1] Estimated.

Rural Stock—Units

According to a Soviet source there were 26.4 million rural housing units in the USSR at the end of 1959.[2] The stock for each year after that was calculated by adding the number of units built, subtracting transfers to urban areas and the amount destroyed for various reasons. Square meters transferred to urban areas were converted to number of units using the average size of units constructed in rural areas the year before. The estimates of amount destroyed were converted to units on the basis of 33.3 sq. m. per unit (the average at the end of 1959) assuming the older, smaller units were destroyed. Calculation of the rural stock by units is summarized below.

[1] *Izvestiya Akademii Stroitel'sva i Arkhitektura SSSR*, Jan 60.
[2] *Zhilishnoye Stroitel'svo*, Jul 65, p. 3.

RURAL STOCK

End year	Thousand units: New construction	Thousand units: Transfer to urban	Thousand units: Destroyed	Stock	Rural population (millions)	Units per thousand population
1959				26,400	108.8	242.6
1960	1,198	216	195	27,187	108.4	250.8
1961	1,085	185	273	27,814	108.8	255.6
1962	958	123	309	28,340	109.1	259.8
1963	911	113	345	28,793	109.0	264.2
1964	807	80	384	29,136	108.9	267.5
1965	800	131	423	29,382	108.5	270.8
1966	804	60	459	29,667	107.9	274.9
1967	793	61	502	29,897	107.4	278.4
1968	728	75	541	30,009	106.6	281.5
1969	698	27	583	30,097	105.7	284.7
1970	686	30	622	30,131	104.9	287.2
1971	666	51	661	30,085	103.8	289.8

Urban Stock—Units

The urban stock in square meters in 1959 was 896 million. It is estimated that the average size of these units was 43.5 sq. m. This is based on average size of units built during years prior to 1959 with an allowance for some large units carried over from Czarist days. Based on this the stock in units at the end of 1959 is calculated to be 20.6 million units. Since 1959 the stock has been estimated by adding the number of units built in urban areas, plus the number of units transferred from rural areas and subtracting the losses. The losses given in *Narkhoz* 72, p. 367 were converted from square meters to units on the basis of 43.5 sq. m. per unit. Calculation of the urban stock by units is summarized below.

URBAN STOCK

End year	Thousand units: New construction	Thousand units: Transfer from rural	Thousand units: Destroyed	Stock	Urban population (millions)	Units per thousand population
1959				20,600	103.6	198.8
1960	1,393	216	134	22,075	107.9	204.6
1961	1,350	185	129	23,481	111.2	211.2
1962	1,425	123	150	24,879	114.4	217.5
1963	1,411	113	168	26,235	117.7	222.9
1964	1,377	80	218	27,747	120.7	227.6
1965	1,427	131	252	28,780	123.7	232.7
1966	1,487	60	323	30,004	126.9	236.4
1967	1,519	61	213	31,371	129.8	241.7
1968	1,505	75	223	32,728	132.9	246.3
1969	1,533	27	241	34,047	136.0	250.3
1970	1,580	30	293	35,364	139.0	254.4
1971	1,590	51	249	36,756	142.5	257.9

Statistical Appendix

TABLE 12.—U.S.S.R.: STOCK OF HOUSING AREA, POPULATION, AND AVERAGE SPACE PER CAPITA, BY LOCATION, SELECTED YEARS, 1913-71

End year	Total			Urban			Rural		
	Housing stock (million of square meters)	Population (million)	Square meters per person	Housing stock (million of square meters)	Population (million)	Square meters per person	Housing stock (million of square meters)	Population (million)	Square meters per person
1913		[1] 139.3		180	[1] 24.8	7.3		[1] 114.5	
1922		[1] 133.5		184	[1] 21.9	8.4		[1] 111.6	
1926		[1] 147.0		216	[1] 26.3	8.2		[1] 120.7	
1940		197.0		421	65.0	6.5		132.0	
1950	1,221	181.6	6.7	513	73.0	7.0	708	108.6	6.5
1955	1,437	197.9	7.3	655	88.2	7.4	782	109.7	7.1
1956	1,493	201.4	7.4	700	91.4	7.7	793	110.0	7.2
1957	1,571	204.9	7.7	762	95.6	8.0	809	109.3	7.4
1958	1,664	208.8	8.0	832	100.0	8.3	832	108.8	7.6
1959	1,768	212.4	8.3	896	103.6	8.6	872	108.8	8.0
1960	1,865	216.3	8.6	958	107.9	8.9	907	108.4	8.4
1961	1,954	220.0	8.9	1,017	111.2	9.1	937	108.8	8.6
1962	2,036	223.5	9.1	1,074	114.4	9.4	952	109.1	8.8
1963	2,115	226.7	9.3	1,130	117.7	9.6	985	109.0	9.0
1964	2,186	229.6	9.5	1,182	120.7	9.8	1,004	108.9	9.2
1965	2,259	232.2	9.7	1,238	123.7	10.0	1,021	108.5	9.4
1966	2,332	234.8	9.9	1,290	126.9	10.2	1,042	107.9	9.7
1967	2,411	237.2	10.2	1,350	129.8	10.4	1,061	107.4	9.9
1968	2,485	239.5	10.4	1,410	132.9	10.6	1,075	106.6	10.1
1969	2,558	241.7	10.6	1,469	136.0	10.8	1,089	105.7	10.3
1970	2,630	243.9	10.8	1,529	139.0	11.0	1,101	104.9	10.5
1971	2,705	246.3	11.0	1,594	142.5	11.2	1,111	103.8	10.7

[1] Population for 1913, 1922, and 1926 is that within the borders of the U.S.S.R. up to Sept. 17, 1939.

Source: Population: 1922 and 1950 to present—"Narodnoye Khozyaystvo SSSR 1922-72," Moscow, 1972, p. 9. 1913 and 1926—"Narkhoz 1962," p. 7. 1940—Estimate based on above 2 sources. Urban housing stock: 1913, 1922, 1940, 1950, 1960, 1965, 1970, and 1971 "Narkhoz 1972," p. 367. 1926—"Strana Sovetov za 50 let," Moscow 1967, p. 248, 1955, 1956, and 1957—Estimate based on information in "Narkhoz 1958," p. 641 and "Narkhoz 1962," p. 499. 1964—"Narkhoz 1965," p. 615. 1966, 1967, and 1968—"Narkhoz 1968," p. 580. 1959—"Narkhoz 1970," p. 546. Rural housing stock: Estimated. See methodological appendix.

TABLE 13.—U.S.S.R.: URBAN HOUSING SPACE PER CAPITA, BY REPUBLICS, THEIR CAPITALS AND THE LARGEST CITIES IN THE R.S.F.S.R., 1971

Republic and city	Percent	Republic and city	Percent
U.S.S.R.	11.2	R.S.F.S.R.—continued	
Moscow	13.9	Saratov	10.6
Latvia	14.1	Kuybyshev	10.4
Riga	13.6	Krasnoyarsk	10.4
Estonia	13.9	Ufa	9.7
Tallinn	13.8	Kazan	9.7
Georgia	12.3	Belorussia	11.0
Tbilisi	10.9	Minsk	11.0
Ukraine	12.0	Moldavia	10.1
Kiev	12.7	Kishinev	10.5
Lithuania	11.5	Armenia	9.9
Vilnius	11.9	Yerevan	9.5
R.S.F.S.R.	11.2	Kazakhstan	9.8
Moscow	13.9	Alma Ata	10.5
Leningrad	12.1	Turkmen	9.7
Chelyabinsk	11.6	Ashkabad	9.7
Volgograd	11.5	Azerbaidzhan	9.4
Sverdlovsk	11.4	Baku	10.3
Voronezh	11.0	Kirgiz	8.9
Goriky	10.9	Frunze	9.3
Rostov-on-Don	10.9	Tadzhikistan	8.8
Novosibirisk	10.8	Dushambe	9.1
Perm	10.8	Uzbekistan	8.2
Omsk	10.6	Tashkent	8.3

Source: "Narodnoye Khozyaystvo S.S.S.R. 1922-72," Moscow, 1972. Republic Stock and Population, pp. 499-692. City Stock, p. 368. City Population, p. 19.

TABLE 14.—U.S.S.R.: AREA OF HOUSING CONSTRUCTED, BY OWNERSHIP AND LOCATION, 1918-75

[In millions of square meters of useful space]

	Total					Urban			Rural			
				Private							Private	
	Total	State	Co-ops	Workers	Collective farmers	Total urban	State and co-op	Private workers	Total rural	State and co-op	Workers	Collective farmers)
1918-28	203.0	23.7	----------	27.5	151.8	(1)	(1)	(1)	(1)	(1)	(1)	151.8
1929-32 (1st FYP)	56.9	32.6	----------	7.6	16.7	(1)	(1)	(1)	(1)	(1)	(1)	16.7
1933-37 (2d FYP)	67.3	37.2	----------	7.1	23.0	(1)	(1)	(1)	(1)	(1)	(1)	23.0
1938-June 1941	81.6	34.4	----------	10.8	36.4	(1)	(1)	(1)	(1)	(1)	(1)	36.4
July 1941-45	102.5	41.3	----------	13.6	47.6	(1)	(1)	(1)	(1)	(1)	(1)	47.6
1946-50 (4th FYP)	200.9	72.4	----------	44.7	83.8	(1)	(1)	(1)	(1)	(1)	(1)	83.8
1951-55 (5th FYP)	240.5	113.0	----------	65.1	62.4	(1)	(1)	(1)	(1)	(1)	(1)	62.4
1956-60 (6th FYP)	474.1	224.0	(2)	113.8	136.3	260.2	189.4	70.8	213.9	34.6	43.0	136.3
1961-65 (7th FYP)	490.6	287.0	13.4	94.0	96.2	291.6	240.8	50.8	199.0	59.6	43.2	96.2
1966-70 (8th FYP)	518.5	319.0	33.5	72.8	93.2	335.5	299.1	36.4	183.0	53.4	36.4	93.2
1971-75 (9th FYP)	580.0	366.2	35.9	75.4	102.5	380.0	337.3	42.7	200.0	64.8	32.7	102.5
1956	63.1	29.5	----------	15.6	18.0	38.0	26.5	11.5	25.1	3.0	4.1	18.0
1957	85.9	38.5	----------	16.8	30.6	48.1	34.6	13.5	37.8	3.9	3.3	30.6
1958	100.3	46.7	----------	27.2	26.4	55.7	39.7	16.0	44.6	7.0	11.2	26.4
1959	115.2	53.5	(2)	27.2	34.5	59.4	44.0	15.4	55.8	9.5	11.8	34.5
1960	109.6	55.8	(2)	27.0	26.8	59.0	44.6	14.4	50.6	11.2	12.6	26.8
1961	102.7	56.5	.1	23.6	22.5	56.1	43.7	12.4	46.6	12.9	11.2	22.5
1962	100.0	59.6	.2	20.7	19.5	58.9	47.5	11.4	41.1	12.3	9.3	19.5
1963	97.6	60.1	1.8	17.4	18.3	58.4	48.6	9.8	39.2	13.3	7.6	18.3
1964	92.7	54.1	4.8	16.2	17.6	57.5	48.3	9.2	35.2	10.6	7.0	17.6
1965	97.6	56.7	6.5	16.1	18.3	60.7	52.7	8.0	36.9	10.5	8.1	18.3
1966	102.1	59.2	6.7	15.9	20.3	63.4	55.7	7.7	38.7	10.2	8.2	20.3
1967	104.5	62.2	6.5	15.6	20.2	66.1	58.3	7.8	38.4	10.4	7.8	20.2
1968	102.1	62.9	6.4	14.2	18.6	66.1	58.9	7.2	36.0	10.4	7.0	18.6
1969	103.8	65.8	6.2	14.1	17.7	68.6	61.5	7.1	35.2	10.5	7.0	17.7
1970	106.0	68.9	7.7	13.0	16.4	71.3	64.7	6.6	34.7	11.9	6.4	16.4
1971	107.6	71.8	6.9	13.0	15.9	72.9	66.9	6.0	34.7	11.8	7.0	15.9
1972	106.0	----------										
Plan 1971	116.6	71.8	7.3	17.0	20.5	76.5	66.2	10.3	40.1	12.9	6.7	20.5
Plan 1972	115.1	73.1	6.8	14.7	20.5	75.2	67.0	8.2	39.9	12.9	6.5	20.5
Plan 1973	115.3	73.2	7.0	14.6	20.5	75.3	67.2	8.1	40.0	13.0	6.5	20.5
Plan 1974	116.2	73.9	7.2	14.6	20.5	76.2	68.1	8.1	40.0	13.0	6.5	20.5
Plan 1975	116.8	74.2	7.6	14.5	20.5	76.8	68.8	8.0	40.0	13.0	6.5	20.5

[1] Not available.

[2] Negligible.

Sources: Total of all FYP except 9th; urban and rural for 7th and 8th FYP and all annual figures 1960-71: "Narodnoye Khozyaystvo SSSR, 1922-72," Moscow, 1972, p. 364-5. (Narkhoz), 1956-58, and 1959-60—distributed total—"Strana Sovetov za 50 let," Moscow, 1967, p. 245. 1959 can be calculated. Annuals 1956, 1957, 1958, for state: "Narkhoz 65" p. 609. Workers-data in Narkhoz 65 adjusted to total figure given in "Strana." Collective Farmers—total given in "Strana" distributed by number of houses built given in "Narkhoz 65," p. 611. For distribution urban and rural. 1959—"Narkhoz 1965", p. 610. 1956, 1957, 1958—Workers in rural "Narkoz 1963," p. 514—footnote, state-estimated. All collective farmers—rural. 9th FYP: JPRS 56,970-2, Sept. 7, 1972. "State 5-year Plan for the Development of the U.S.S.R. National Economy for the period 1971-75," pt. II, p. 366 and 319. It is estimated that 5 percent of co-op construction will be in rural areas. 1972—"Izvestiya," Jan. 30, 1973, p. 3.

TABLE 15.—U.S.S.R.: AVERAGE SIZE OF VARIOUS TYPES OF HOUSING CONSTRUCTED, 1950–71

[Useful space]

	Total			State and co-ops			Private					
							Workers			Collective farmers		
	Million square meters	Number of units (thousands)	Average size (square meters)	Million square meters	Number of units (thousands)	Average size (square meters)	Million square meters	Number of units (thousands)	Average size (square meters)	Million square meters	Number of units (thousands)	Average size (square meters)
1950	40.4	1,073	37.7	17.8	412	43.2	10.1	306	33.0	12.5	355	35.2
1951–55	240.5	6,052	39.7	113.0	2,598	43.5	65.1	1,816	35.8	62.4	1,638	38.1
1956	63.1	1,548	40.8	29.5	658	44.8	15.6	420	37.1	18.0	470	38.3
1957	85.9	2,060	41.7	38.5	857	44.9	16.8	435	38.6	30.6	768	39.8
1958	100.3	2,382	42.1	46.7	1,055	44.3	27.2	676	40.2	26.4	651	40.6
1959	115.2	2,711	42.5	53.5	1,237	43.2	27.2	640	42.5	34.5	834	41.4
1960	109.6	2,591	42.3	55.8	1,319	42.3	27.0	635	42.5	26.8	637	42.1
1961	102.7	2,435	42.2	56.6	1,383	40.9	23.6	537	43.9	22.5	515	43.7
1962	100.0	2,383	42.0	59.8	1,471	40.7	20.7	467	44.3	19.5	445	43.8
1963	97.6	2,322	42.0	61.9	1,522	40.7	17.4	384	45.3	18.3	416	44.0
1964	92.7	2,184	42.4	58.9	1,432	41.1	16.2	358	45.3	17.6	394	44.7
1965	97.6	2,227	43.8	63.2	1,511	41.8	16.1	336	47.9	18.3	380	48.2
1966	102.1	2,291	44.6	65.9	1,574	41.9	15.9	324	49.1	20.3	393	51.7
1967	104.5	2,312	45.2	68.7	1,604	42.8	15.6	316	49.4	20.2	392	51.5
1968	102.1	2,233	45.7	69.3	1,603	43.2	14.2	282	50.4	18.6	348	53.4
1969	103.8	2,231	46.5	72.0	1,637	44.0	14.1	269	52.4	17.7	325	54.5
1970	106.0	2,266	46.8	76.6	1,723	44.5	13.0	246	52.8	16.4	297	55.2
1971	107.6	2,256	47.7	78.7	1,745	45.1	13.0	232	56.0	15.9	279	57.0
1972	106.0	2,200	48.2									

Source: Square meters of housing, table 14. 1950, "Narkhoz 70," pp. 542–4. Number of units: 1950, 1951–55, and 1961 on: "Narkhoz 72," p. 366. 1956 through 1960: "Narkhoz 65," p. 611. The data for 1956–58 for collective farmers includes some housing built by workers in rural areas. This taken out using data from "Narkhoz 63," p. 514 footnote. Annual allocation to various categories estimated but made to agree with 5 year totals.

TABLE 16.—U.S.S.R.: COST OF HOUSING BY CATEGORY OF OWNER, 1956–75

	State and co-op			Private sector		
	Housing investment (million rubles)	Housing constructed (million square meters)	Rubles per square meter	Housing investment (million rubles)	Housing constructed (million square meters)	Rubles per square meter
1956	3,561	29.5	120.7	1,884	33.6	56.1
1957	5,022	38.5	130.4	2,542	47.4	53.6
1958	5,906	46.7	126.5	3,291	53.6	61.4
1959	6,393	53.5	119.5	3,786	61.7	61.4
1960	6,712	55.8	120.3	3,403	53.8	63.3
1961	6,760	56.6	119.4	2,961	46.1	64.2
1962	6,907	59.8	115.5	2,580	40.2	64.2
1963	7,164	61.9	115.7	2,257	35.7	63.2
1964	6,967	58.9	118.3	2,114	33.8	62.5
1965	7,794	63.2	123.3	2,287	34.4	66.5
1966	8,747	65.9	132.7	2,334	36.2	64.5
1967	9,503	68.7	138.3	2,422	35.8	67.7
1968	10,200	69.3	147.2	2,319	32.8	70.7
1969	10,441	72.0	145.0	2,255	31.8	70.9
1970	11,349	76.6	148.2	2,090	29.4	71.1
1971	11,896	78.7	151.2	2,200	28.9	76.1
Plan 1972	11,870	79.9	148.6	2,750	35.2	78.1
Plan 1973	12,000	80.2	149.6	2,760	35.1	78.6
Plan 1974	12,260	81.1	151.2	2,760	35.1	78.6
Plan 1975	12,450	81.8	152.2	2,750	35.0	78.6

Source: Investment data, same sources as table 17.
Area of housing constructed from table 14.

TABLE 17.—U.S.S.R.: HOUSING AS A PERCENTAGE OF TOTAL CAPITAL INVESTMENT, 1918–75

	Capital investment—Soviet data		Capital investment adjusted data		
	Total investment	Investment in housing	Total investment	Investment in housing	Housing share
	Billion rubles				Percent
1918–28	4.4	2.8	5.0	3.4	68
1929–32 (1st FYP)	8.8	1.4	8.9	1.5	17
1933–37 (2d FYP)	19.9	2.5	20.0	2.7	14
1938–June 1941	20.6	3.5	20.9	3.8	18
July 1941–45	20.8	3.1	21.2	3.5	17
1946–50 (4th FYP)	48.1	9.2	49.0	10.2	21
1951–55 (5th FYP)	91.1	17.9	92.4	19.1	21
1956–60 (6th FYP)	170.5	39.6	173.4	42.5	25
1961–65 (7th FYP)	247.6	45.4	249.9	47.8	19
1966–70 (8th FYP)	353.8	60.0	355.7	61.7	17
Plan 1971–75 (9th FYP)	501.0	73.5	501.0	73.5	15
1956	26.0	5.1	26.4	5.4	20
1957	29.5	7.1	30.0	7.6	25
1958	34.2	8.6	34.8	9.2	26
1959	38.8	9.4	39.5	10.2	26
1960	42.0	9.4	42.7	10.1	24
1961	43.8	9.1	44.4	9.7	22
1962	45.9	9.0	46.4	9.5	20
1963	48.3	9.0	48.7	9.4	19
1964	52.6	8.7	53.0	9.1	17
1965	57.0	9.6	57.4	10.1	18
1966	61.0	10.6	61.5	11.1	18
1967	66.0	11.5	66.5	11.9	18
1968	71.2	12.1	71.7	12.5	17
1969	73.6	12.4	73.9	12.7	17
1970	82.0	13.4	82.1	13.5	16
1971	88.0	14.1	88.0	14.1	16
Plan 1972	92.5	14.6	92.5	14.6	16
Plan 1973	100.9	14.8	100.9	14.8	15
Plan 1974	107.7	15.0	107.7	15.0	14
Plan 1975	113.6	15.2	113.6	15.2	13

Source: 5-year plan data and 1965 through 1971. Narkhoz 72, p. 326–7. (Both total and housing investment.) Total capital investment, 1961–64, and capital investment in housing by individuals, Ibid., p. 321. 1960—total capital investment—Narkhoz 70, p. 488. 1960—housing investment—Narkhoz 70, p. 541. Totals for the 6th and 7th FYP were distributed annually according to data in several earlier Narkhoz's. Adjustment factor of 0.24 is based on comparison of housing investment by State and co-op as shown in Narkhoz 72 and Narkhoz 69 or earlier. Investment by individuals was multiplied by the adjustment factor and the increase added to both total investment and housing investment to give the adjusted investment figures.

TABLE 18.—U.S.S.R.: STOCK OF URBAN HOUSING, SOCIALIZED AND PRIVATE, 1958–71

	Total (million square meters)	Socialized sector		Private sector	
		Million square meters	Percent	Million square meters	Percent
End of year:					
1958	832	500	60.1	332	39.9
1959	896	541	60.4	355	39.6
1960	958	583	60.9	375	39.1
1961	1,017	626	61.6	391	38.4
1962	1,074	670	62.4	404	37.6
1963	1,130	716	63.4	414	36.6
1964	1,182	759	64.2	423	35.8
1965	1,238	806	65.1	432	34.9
1966	1,290	854	66.2	436	33.8
1967	1,350	906	67.1	444	32.9
1968	1,410	959	68.0	451	32.0
1969	1,469	1,014	69.0	455	31.0
1970	1,529	1,072	70.1	457	29.9
1971	1,594	1,132	71.0	462	29.0

Source: Narkhoz 72, p. 367; Narkhoz 70, p. 546; Narkhoz 68, p. 580; Narkhoz 64, p. 610; Narkhoz 62, p. 499.

TABLE 19.—UKRAINIAN S.S.R.: AMENITIES FURNISHED NEW URBAN HOUSING CONSTRUCTION, 1966–70

	Having all amenities [1]	All except hot water	All except hot water and bath or shower [2]
1966	47.8	86.5	91.2
1967	56.7	88.9	92.9
1968	50.7	83.9	86.1
1969	59.9	90.6	94.2
1970	60.3	90.5	94.9

[1] Running water, sewage, central heating, bath or shower, and hot water.
[2] The remaining 5 to 14 percent presumably have none or only 1 or 2 amenities.

Source: JPRS 57845, Dec. 26, 1972, translated from article by E. I. Shilov, "Stroitelstvo i Arkhitektura," No. 10, 1972, pp. 11–13.

TABLE 20.—U.S.S.R.: ANNUAL HOUSING CONSTRUCTION PLAN BY CATEGORY OF OWNER AND COMPLETION 1971–75

[Million square meters]

	Total		State		Co-op		Private			
							Workers		Collective farmers	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
1971	116.6	107.6	71.8	71.8	7.3	6.9	17.0	13.0	20.5	15.9
1972	115.1	106.0	73.1	[1] (72.0)	6.8	[1] (6.5)	14.7	[1] (12.5)	20.5	[1] (15.0)
1973	[2] 115.3	.....	73.2	.....	7.0	.....	14.6	.....	20.5	.....
1974	116.2	.....	73.9	.....	7.2	.....	14.6	.....	20.5	.....
1975	116.8	.....	74.2	.....	7.6	.....	14.5	.....	20.5	.....
1971–75	580.0	.....	366.2	.....	35.9	.....	75.4	.....	102.5	.....
1966–70	[3] 588.0	.....	348.0	.....	52.0	.....	80.0	.....	108.0	.....
1966–70 (revised)	[4] 574.0	518.5	338.0	319.0	50.0	33.5	78.0	72.8	108.0	93.2

[1] Estimate.
[2] 1973 annual plan increased to 117.6 but breakdown not published. JPRS 57864, Dec. 29, 1972, p. 21.
[3] Original plan reported as 480,000,000 m² plus 2 to 2,500,000 houses to be built by collective farmers. FBIS, Daily Report, Supplement, U.S.S.R. and east Europe, No. 36(55) 1966, Feb. 23, 1966, p. 25. Co-op plan given in V. T. Robotov, "Finansirovaniye i Kreditovaniye Zhilishchnovo Stroitel' stva," Moscow 1967, p. 109. Collective farms converted 2,400,000 houses at 45 m² per house. The 2,400,000 came from revised plan "d" below.
[4] "Pravda", Oct. 11, 1967, p. 3. Revised plan for 5 years is 466,000,000 m² plus 2,400,000 houses built by collective farmers. Assumed all types decreased same percentage.

Source: JPRS 56970-2, "State 5-Year Plan for the Development of the U.S.S.R. National Economy for the Period 1971–75," part II, p. 366. Actual 1971: "Narodnoye Khozyaystvo S.S.S.R., 1922–1972," Moscow 1972, pp. 364–5 and co-op data from pp. 499–692, scattered references. Actual 1972: "Izvestiya," Jan. 30, 1973, p. 3.

Part VI. HUMAN RESOURCES AND EDUCATION

DEMOGRAPHIC TRENDS IN THE U.S.S.R.

By FREDERICK A. LEEDY*

CONTENTS

I. SUMMARY

This paper contains a brief survey of population change in the U.S.S.R. since 1950, including growth of the total population, its changing age and sex distribution, and trends in vital rates and the various factors affecting them. It presents a description of change in the ethnic composition of the population during the intercensal period, 1959–70, and discusses the redistribution of the population among the republics and between urban and rural areas during these years. It also discusses population policy in the U.S.S.R. Finally, the report presents projections of the population, by age and sex, through the year 2000, and discusses change in the structure of the population during the course of the present 5-year plan period (1971–75) and succeeding 5-year periods.

The paper is based on information available as of March 1, 1973. Volumes II and III of the published results from the Soviet population census of January 15, 1970, were received in mid-March and their contents are not reflected in the age-sex distributions of the populations given here for the census years of 1959 and 1970, nor in the estimates and projections prepared for earlier and future years. Preliminary inspection of the small amount of new data given in these volumes in-

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dicates, however, that the estimates and projections shown would change only slightly if the new data were used.

The dominant features of the demographic trends in the Soviet Union during the 1960's were the steadily declining fertility and the concomitant decreasing rate of population growth. As in many other countries of Eastern and Western Europe, in the U.S.S.R. the population had a spurt of growth in the immediate postwar years, followed by a period of rapid increase throughout the 1950's. By the early 1960's, however, the rate had begun to decline, and in 1969 it was 8.9 per 1,000 population, just half the level of 17.8 per 1.000 reported for 1960. The rate increased slightly in the years 1970–72 and will probably continue to rise during the remaining part of the decade, but to a level far below that achieved in the late fifties. The total population of 241.7 million reported for the census of January 15, 1970, was 63.2 million above the total of 178.5 million at the beginning of 1950 and 32.9 million above the 1959 census total of 208.8 million.

Changes in the age and sex composition of the population during the years 1950–70 were affected not only by the changing birth and death rates but also by the consequences of many catastrophic events which occurred in earlier years. The population under working age and that in the working (or able-bodied) ages fluctuated slightly as proportions of the total, but both proportions decreased slightly over the 20 years and the share of the population in the older, pension ages increased. As a result of these shifts, the median age of the population increased by over 5 years to 29.5 years in 1970, and the dependency ratio rose from 739 persons in the younger and older ages per 1,000 persons in the working ages in 1950 to 850 in 1970. The two decades of "normal" growth also resulted in a reduction of the deficit of males caused by wars and civil strife since the turn of the century, and the sex ratio of 78 males per 100 females in 1950 rose to nearly 86 in 1970.

The Russians continued to be the majority ethnic group in 1970, although they lost slightly as a proportion of the total during the previous 11 years. High birth and natural increase rates among the peoples of Kazakhstan and Central Asia (the Uzbeks, Tadzhiks, Turkmenians, and Kirgiz) resulted in significant increases in both their numbers and proportions of the total.

The most significant contribution to the decline in the rate of population growth during the 1960's was that due to the drop in numbers of births—a function of both declining fertility rates and numbers of women in the prime childbearing ages. The birth rate, which had remained fairly constant in the 1950's dropped sharply during the sixties, increased slightly in the early 1970's, and can be expected to continue increasing throughout this decade due to the entry into the prime childbearing ages of large cohorts of women born during the 1950's. A decline in mortality contributed to a high rate of natural increase during the 1950's, but in the 1960's the death rate rose slowly and played a part in reducing the rate of natural increase. This recent increase in numbers of deaths has been due to the aging of the population and to a rise of mortality rates for males in all age groups above 24 years of age.

Change in the distribution of the population among the various regions of the country during the intercensal years followed patterns

established in preceding periods. Thus, the shift of population eastward continued, and the proportion of the total living east of the Urals rose from 22 percent in 1959 to 24 percent in 1970. Internal migration was a significant factor in this shift, as was the relatively high rate of natural increase among the peoples of the Central Asian republics and Kazakhstan. These two factors of migration and high natural increase also contributed to the increased share of the total population living in the Transcaucasus and the North Caucasus. Many parts of central European Russia lost population between the censuses, primarily because of outmigration to the east and south and to urban industrial areas of the west. The total urban population increased by 36 percent between 1959 and 1970, and comprised 56 percent of the total in the latter year. The rural population declined by 3 percent during this period.

The decreasing rate of population growth has been often noted in the Soviet press and academic circles, and a rapidly increasing amount of discussion and analysis has been devoted to it. The serious study of demography has been permitted to resume after a lapse of nearly 30 years, and a number of research institutes and academic centers are now engaged in research on many aspects of demographic change. Numerous studies have shown that the fertility behavior of Soviet women is being increasingly affected by factors operating to lower the number of children desired—including urbanization, industrialization, increased demands for more education, greater participation in political, economic, and cultural activities, and the shortage of housing. The ready availability of abortion and the increasing availability of contraceptives have made it relatively easy for Soviet women to control their numbers of births and accommodate to these new patterns of life. Serious consideration is being given by Soviet analysts and policymakers to the question of instituting an explicit pronatalist population policy, but at present there is no clear indication that current programs and practices will be altered.

If fertility remains constant at the 1971 level, the total population of the U.S.S.R. is projected to be about 320 million on January 1, 2000, an increase of nearly 71 million (29 percent) over the total of 249 reported for January 1, 1973. If fertility declines, as it has done over the past decade, the total is projected to be between 292 and 306 million at the beginning of 2000, or an increase of between 18 and 23 percent over the projection period. A projection made on the assumption that fertility will rise steadily until 1982, then remain constant, indicates that the population on January 1, 2000, would be nearly 348 million, an increase of 40 percent over the total for the beginning of 1973. All series of projections show that the excess of females over males will continue to decline, and those based on a stable or declining level of fertility indicate slowly aging populations.

II. Population Change, 1950–72

Total Population

Following a period of sustained rapid growth in the 1950's, the Soviet population grew at a steadily decreasing rate during the 1960's. Over the two decades, 1950–70, the total population increased by 63.2

million, or 35 percent (table 1). More than half of this increase occurred during the fifties, however, and the population grew by 19 percent (33.9 million) in that decade but by only 14 percent (23.9 million) in the sixties.

TABLE 1.—TOTAL POPULATION: 1950–73

[In millions. As of January 1]

Year—	Number	Year—	Number
1950	178.5	1966	232.2
1955	194.4	1970 [1]	241.7
1959 [1]	208.8	1971	243.9
1960	212.4	1972	246.3
1965	229.6	1973	248.6

[1] As of the census, Jan. 15.

Source: 1959: "Izvestiya" May 10, 1959. 1970: "Izvestiya," Apr. 19, 1970. 1973: "Izvestiya," Jan. 30, 1973. All other years: App. table I.

As the data in table 2 show, the period of fastest growth was the latter half of the 1950's; in fact, the peak year for the rate of growth was 1958, when due to a sharp dip in the death rate the natural increase rate was 1.81 percent (App. table I). Population growth in the intercensal period was at the relatively moderate average level of 1.34 percent per year, but again the greater part of the increase was in the earlier part of the period. Annual rates of growth for the two plan periods show that the level dropped more than one-third from the first to the latter half of the sixties. The rate of increase reached a low point in 1969, when it was less than half that recorded in 1958. In terms of numbers of persons added to the population, the 2.1 million increment during 1969 was only about 60 percent of the annual average 3.6 million increment during the late 1950's. The rate of increase turned upward in the first 3 years of the present decade (App. table I), due largely to a rising number of births from an increasingly large category of young women born in the early postwar period.

TABLE 2.—GROWTH OF THE POPULATION: 1950–73

Period	Number (millions)	Percent	
		Overall	Annual average
1950–54	15.9	8.9	1.72
1955–59	18.0	9.3	1.79
1960–64	17.2	8.1	1.57
1965–69	12.1	5.3	1.03
1970–72	6.9	2.9	.94
Intercensal: 1959–70 (Jan. 15)	32.9	15.8	1.34
Plan:			
1959–65	23.4	11.2	1.53
1966–70	11.7	5.0	.99

Source: Table 1.

Estimates and projections of the populations of the NATO and the Warsaw Pact countries, for selected years in the period 1950–85, are given in table 3. These data show that despite its declining growth rate, the population of the U.S.S.R. has consistently increased much more rapidly than that of the other Warsaw Pact countries, rising

from 67 percent of the total in 1950 to 70 percent in 1970. Projected totals for the U.S.S.R. (series B figures, as described in chapter VI, of this study) indicate that this trend will continue and by 1985 the Soviet population will comprise 71 percent of the total embraced by the Warsaw Pact.

During the years 1950–65, the population of the U.S.S.R. grew slightly more rapidly than that of the United States, but during the last half of the sixties the pattern was reversed. As projected to 1985, the populations of both countries will increase at an average rate of about 1.0 percent per year. The population of the other NATO countries has grown faster since 1950 than that of the other Warsaw Pact countries. As a consequence of these differential growth rates, the total population in the Warsaw Pact nations increased from 64.2 percent of the total in the NATO nations in 1950 to 65.4 percent in 1960; the proportion then declined to 65.1 percent in 1970, and is projected to decrease very slightly to 64.9 percent in 1985—the same proportion as existed 30 years previously, in 1955.

TABLE 3.—POPULATION OF NATO AND WARSAW PACT COUNTRIES: 1950–85

[Absolute figures in millions. As of July 1]

Year	NATO countries			Warsaw Pact countries			Warsaw Pact as percent of NATO
	United States	Other [1]	Total	U.S.S.R.	Other [2]	Total	
1950	152.3	266.2	418.5	180.1	88.5	268.6	64.2
1955	165.9	279.3	445.2	196.2	92.8	289.0	64.9
1960	180.7	295.2	475.9	214.3	96.7	311.0	65.4
1965	194.2	312.2	506.4	230.9	99.7	330.6	65.3
1970	204.9	326.7	531.6	242.8	103.2	346.0	65.1
1973	210.5	335.9	546.4	250.0	105.0	355.0	65.0
1974	212.2	339.1	551.3	252.5	105.6	358.1	65.0
1975	213.9	342.1	556.0	255.0	106.4	361.4	65.0
1980	224.1	358.3	582.4	268.5	110.1	378.6	65.0
1985	235.7	375.4	611.1	283.0	113.4	396.4	64.9
Percent increase:							
1950–55	8.9	4.9	6.4	8.9	4.9	7.6	(3)
1955–60	8.9	5.7	6.9	9.2	4.2	7.6	(3)
1960–65	7.5	5.8	6.4	7.8	3.1	6.3	(3)
1965–70	5.5	4.6	5.0	5.2	3.5	4.7	(3)
1970–75	4.4	4.7	4.6	5.0	3.1	4.4	(3)
1975–80	4.8	4.7	4.7	5.3	3.5	4.8	(3)
1980–85	5.2	4.8	4.9	5.4	3.0	4.7	(3)

[1] Consists of Belgium, Canada, Denmark, France, West Germany (including West Berlin), Greece, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, Turkey, and the United Kingdom.
[2] Consists of Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania.
[3] Not applicable.

Source: Except for the projections for the United States, prepared by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, in May 1972 from official materials of the countries included. The projections for the United States are the E series as given in U.S. Bureau of the Census, "Projections," 1972, pp. 11, 12.

Age-Sex Distribution

Changing trends in the age structure of the Soviet population reflect the growth rates since 1950 noted above—as well as the numerous catastrophic events which have affected it during this century. Details of these changes, by 5-year age group and sex, can be seen in appendix table II; a brief picture of the trends is shown by the data relating to broad age groups in table 4. The high growth rates of the fifties and early sixties are reflected in the sizable increase of the age group 0–15

years between 1955 and 1965, and the decreasing growth rates of the mid and late sixties are apparent from the net decrease in this age group between 1965 and 1970. Despite these widely varying changes, the population in the younger ages shifted only slightly during the period as a proportion of the total population.

TABLE 4.—TOTAL POPULATION, BY SELECTED AGE GROUP: 1950 TO 1970

[Absolute numbers in thousands. As of January 1. Figures may not add to totals due to rounding]

Age group	1950	1955	1960	1965	1970
0 to 15 years	57,386	59,023	66,647	75,650	74,768
Net change	(4)	1,637	7,624	9,003	−882
16 to 59/54 years [1]	102,656	113,441	119,467	123,366	130,586
Net change	(4)	10,785	6,026	3,899	7,220
60/55 years and over [2]	18,505	21,951	26,258	30,612	36,281
Net change	(4)	3,446	4,307	4,354	5,669
PERCENT DISTRIBUTION					
Total	100.0	100.0	100.0	100.0	100.0
0 to 15 years	32.1	30.4	31.4	32.9	30.9
16 to 59/54 years	57.5	58.3	56.3	53.7	54.0
60/55 years and over	10.4	11.3	12.4	13.3	15.0
DEPENDENCY RATIO [3]	739.0	714.0	778.0	861.0	850.0

[1] Males 16 to 59 years old and females 16 to 54 years old.
[2] Males 60 years old and over and females 55 years old and over.
[3] Number of persons under age 16 and 60/55 and over per 1,000 persons of ages 16 to 59/54.
[4] Not applicable.

Source: Appendix table II.

The population in the working, or "able-bodied" ages—16 to 59 for males and 16 to 54 for females—increased less rapidly during the years shown than did those in the other two broad age groups and as a consequence it declined as a share of the total population. By far the greatest annual increases to this age group occurred in the early 1950's, in large part due to entry of birth cohorts of the late 1930's into the age group. The number of persons in the older ages increased relatively more rapidly than those in the other two broad age groups between 1950 and 1970, nearly doubling in size and rising steadily as a proportion of the total population.

These shifts in age structure resulted in a significant rise in the dependency ratio, from 739 persons in the younger and older ages per 1,000 persons in the able-bodied ages in 1950 to 850 in 1970. The median age of the population also rose, from 24.2 years in 1950 to 26.9 years in 1960 and 29.5 years in 1970.

A quarter-century of "normal" growth after the end of World War II enabled the Soviet population to partially overcome the great deficit of males created by that war as well as by earlier wars, the revolution, and other catastrophic events. Thus, the excess of 21.8 million females which existed in 1950 was reduced to 18.9 million by 1970 (table 5). The process of rectifying an abnormal sex distribution is slow, however, and the sex ratio of 85.5 males per 100 females reported in the 1970 census results is still far from a "normal" ratio of 95–99 males per 100 females. The projections given in app. table II indicate that as of the year 2000 this ratio will be approximately 92.

TABLE 5.—POPULATION, BY SEX: 1950 TO 1970

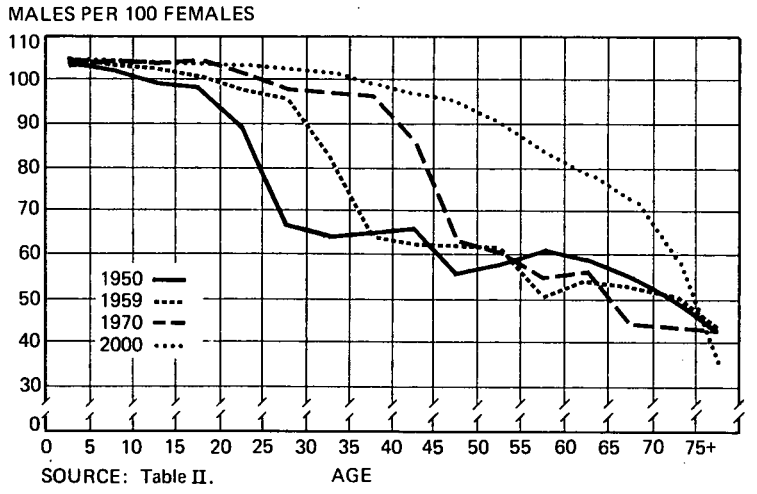
[Absolute figures in thousands. As of January 1]

Year	Males	Females	Excess of females over males	Males per 100 females
1950	78,382	100,165	21,783	78.3
1955	86,563	107,852	21,289	80.3
1960	95,962	116,410	20,448	82.4
1965	104,941	124,687	19,746	84.2
1970	111,355	130,280	18,925	85.5

Source: Appendix table II.

A graphic picture of the changing pattern of sex ratios in the Soviet population, by 5-year age group, is given in figure 1. The line for 1950 indicates a relatively normal level of sex ratios through the age group 15–19 years. Above this age the line drops sharply, however, reflecting the excessive male losses of earlier years. The lines for 1959 and 1970 follow a similar pattern, though the normal level of sex ratios extends 9 and 20 more years, respectively. By the year 2000 the curve more nearly reflects the structure of a normal population, dropping sharply only after age 70.

Figure 1 —Sex Ratios, by Age: 1950, 1959, 1970, and 2000



SOURCE: Table II.

Ethnic Composition

Estimates of the size of ethnic groups in the U.S.S.R. are not reported for intercensal years and the results of the 1970 census provide the first view of the changes in this important element of Soviet society since the 1959 census was taken. Two questions were asked in the 1970 census concerning ethnic group. Question number 7 asked for "nationality," and required the enumerator to enter the nationality given by the respondent. The nationality of children was to be determined by

the parents, although the nationality of the mother was to be used if the parents were of different nationalities and could not decide about the children. Question number 8 called for the language which the respondent considered to be his native language; the native language for children who had not yet begun to talk was to be entered as the language normally spoken in the family. In addition, if the respondent was fluent in another language spoken by one of the peoples in the U.S.S.R., the enumerator was also to enter the name of that language.[1] The same two questions were asked in 1959, although the additional language in question 8 was not asked for.

Appendix table V presents figures on the ethnic composition of the Soviet population as of the censuses in 1959 and 1970, by 91 ethnic groups, or "nationalities." The numbers of Great Russians increased slightly less rapidly than the total population and therefore decreased as a proportion of the total, but this group still constitutes a distinct majority (53.4 percent) of all Soviet peoples. In considering the number of Russians and this proportion, however, one must keep in mind that any Soviet citizen—no matter what his true origin—could be enumerated as a Russian in the census and that the total for this primary ethnic group may well be significantly exaggerated as a result of assimilation or expediency. The other two principal Slavic groups, the Ukrainians and Belorussians, also grew less rapidly than the total. These three Slavic groups comprised 76.3 percent of the total population in 1959 and 74.0 percent in 1970. Significant increases in the numbers and proportions of Kazakhs and other ethnic groups of the Central Asian republics bear witness to high rates of growth in these areas.

Seven of the ethnic groups listed in the census results showed a decrease in numbers between 1959 and 1970. For five of these groups, the Mordvinians, Karelians, Finns, Czechs, and Slovaks, the numerical decrease was quite small and can probably be explained by one or a combination of the factors of assimilation, high mortality of an aging group of peoples, or even emigration. The largest decrease shown is for the Poles, who dropped by 213,000, or more than 15 percent. If the national increase rate of 15.8 percent during the intercensal period is applied to the number of Poles enumerated in 1959, an expected total of 1,598,000 for 1970 can be derived, which would yield a gross decrease of 431,000 (31 percent) between the censuses. All factors listed above have probably been instrumental in this decline, especially emigration, although an additional consideration is that the number of Poles enumerated in the 1959 census may have been exaggerated and at least part of the decline was spurious.[2]

The decline of 117,000, or 5.2 percent, in the number of Jews is of particular interest, given the continuing controversy over their status in Soviet society. If an increase equivalent to that recorded for the Ukrainians (9.4 percent) is assumed for the Jews between 1959 and 1970, a total of approximately 2,480,000 could be expected in 1970, which would mean a gross loss of 330,000 persons, or about 15 percent

[1] *Vestnik statistiki*, no. 3, 1968, p. 49.

[2] Speaking at the All-Union Conference of Statisticians in 1968, S. I. Bruk, Deputy Director of the Institute of Ethnography, U.S.S.R. Academy of Sciences, referred to a claim by Cardinal Vyshinskiy of Poland that Catholic Belorussians and Lithuanians declared themselves as Poles in the 1959 census in an attempt to prevent the Polish Roman Catholic churches in these republics from being closed. Bruk appeared to accept this claim. The assumption must be made here, however, that such persons did not declare themselves as Poles in 1970. Also, the data in app. table V indicate that the Belorussians increased by 14.4 percent and the Lithuanians by 14.6 percent during the intercensal period; these rates of increase would be lower if there were indeed more persons in each ethnic group in 1959. TsSU, *Vsesoyuznoye*, 1969, p. 227.

of the 1959 total. Emigration of Jews during the 20-year period 1950–69 has been estimated at only 15,000 [3] so the most probable explanation for the lower total in the 1970 census is assimilation or expediency. Assimilation was explicitly offered as the reason for the decline—as well as that for the Mordavinians and Karelians—by Lev Volodarskiy, Deputy Chief of the Central Statistical Administration.[4] The number of Jews dropped sharply in the R.S.F.S.R. and the Ukraine; dropped slightly in Belorussia, Lithuania, and Estonia; increased in Uzbekistan, Georgia, and Moldavia; and remained at the same level in Latvia.[5] None were disaggregated in the other republics in the primary census results.

It is of note that for all seven ethnic groups showing a decrease in size between 1959 and 1970 the proportion which considered the language of the ethnic group as its native language dropped, in most cases sharply. Again, the drop was proportionately largest for the Poles, and next for the Jews. Only 17.7 percent of the Jews in the Soviet Union in 1970 considered Yiddish as their native language, by far the lowest such proportion shown in the census returns.

The number of Russians increased in all republics but one, Georgia, during the intercensal period (table 6). Outside of the R.S.F.S.R., this increase was largest in the Ukraine, 2,035,000, followed by that in Kazakhstan, 1,550,000—in both cases no doubt due in an overwhelming degree to migration. In two republics, Kazakhstan and Kirgiziya, the basic ethnic group did not make up half of the population, and in Kazakhstan there were more Russians than Kazakhs. Due to high rates of natural increase, the basic ethnic groups in Kazakhstan and the republics of Central Asia and the Transcaucasus increased as a proportion of the population in each republic—despite in most cases a sizable influx of Russians. The basic ethnic group of the R.S.F.S.R. and all western republics except Lithuania decreased as a proportion of total republic population.

TABLE 6.—SIZE OF THE BASIC ETHNIC GROUP AND OF THE RUSSIAN ETHNIC GROUP, BY REPUBLIC: 1959 AND 1970

[Absolute numbers in thousands. As of January 15]

Republic	Total population		Of which				Percent of total			
			Basic ethnic group of the republic		Russian		Basic ethnic group of the republic		Russian	
	1959	1970	1959	1970	1959	1970	1959	1970	1959	1970
R.S.F.S.R.	117,534	130,079	97,864	107,748	97,864	107,748	83.3	82.8	83.3	82.8
Ukrainian S.S.R.	41,869	47,126	32,158	35,284	7,091	9,126	76.8	74.9	16.9	19.4
Belorussian S.S.R.	8,056	9,002	6,532	7,290	660	938	81.1	81.0	8.2	10.4
Uzbek S.S.R.	8,261	11,960	5,044	7,734	1,114	1,496	61.1	64.7	13.5	12.5
Kazakh S.S.R.	9,153	12,849	2,723	4,161	3,950	5,500	29.8	32.4	43.2	42.8
Georgian S.S.R.	4,044	4,686	2,601	3,131	408	397	64.3	66.8	10.1	8.5
Azerbaydzhan S.S.R.	3,698	5,117	2,494	3,777	501	510	67.5	73.8	13.6	10.0
Lithuanian S.S.R.	2,711	3,128	2,151	2,507	231	268	79.3	80.1	8.5	8.6
Moldavian S.S.R.	2,885	3,569	1,887	2,304	293	414	65.4	64.6	10.2	11.6
Latvian S.S.R.	2,093	2,364	1,298	1,342	556	705	62.0	56.8	26.6	29.8
Kirgiz S.S.R.	2,066	2,933	837	1,285	624	856	40.5	43.8	30.2	29.2
Tadzhik S.S.R.	1,981	2,900	1,051	1,630	263	344	53.1	56.2	13.3	11.9
Armenian S.S.R.	1,763	2,492	1,552	2,208	56	66	88.0	88.6	3.2	2.7
Turkmen S.S.R.	1,516	2,159	924	1,417	263	313	60.9	65.6	17.3	14.5
Estonian S.S.R.	1,197	1,356	893	925	240	335	74.6	68.2	20.1	24.7

Source: "Izvestiya," Apr. 17, 1971.

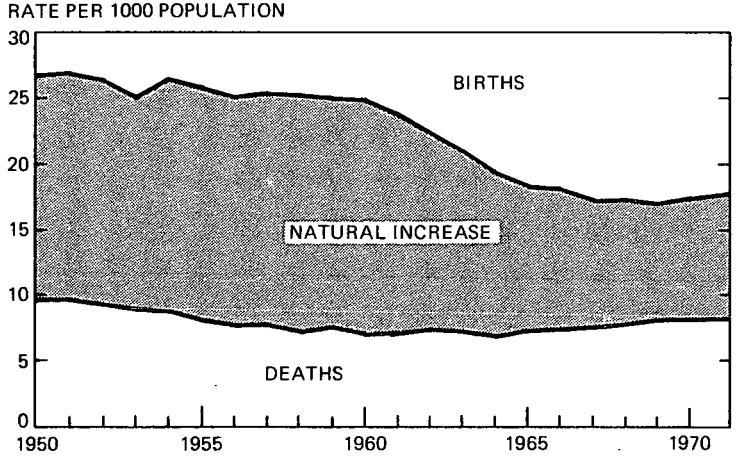
[3] *New York Times*, April 17, 1971.
[4] *Pravda*, May 7, 1971.
[5] *Izvestiya*, April 17, 1971.

III. Trends in Vital Rates, 1950–71

The size and rate of growth of the Soviet population since the end of World War II have been determined by the numbers of births and deaths. Migration has been a negligible factor in demographic development. The discussion here is concerned with the trends in the numbers of deaths and births, as reflected in both crude and age-specific rates.[6]

The overall indicator of growth of population, the natural increase rate, was stable during the fifties but declined steadily during the sixties (table 7). Starting from a level of 17 per 1,000 population in 1950, the natural increase rate varied only slightly throughout the 1950's, reaching a high of 18.1 in 1958 (App. table I). Beginning in 1961, however, the rate dropped each year through 1969, when the level of 8.9 per 1,000 was only slightly above half (52 percent) of the level in 1950. The slight increases shown for 1970 and 1971 reflect an increase in the birth rate. The levels of the vital rates in the U.S.S.R. from 1950 through 1971 are shown in figure 2.

Figure 2—Vital Rates: 1950 to 1971



SOURCE: Table I.

[6] Vital rates as reported in official publications by the Central Statistical Administration are used as the basis for discussion in this section. There is some evidence of undercounting of both births and deaths, although no adjustments or allowances were made due to lack of data. An analysis of the age-sex distribution of the population as of the census on January 15, 1970, suggests an underregistration of births: i.e., survival of the reported numbers of births for all years from 1959 through 1969, by sex, using reported mortality rates, yields fewer persons in the age groups 0–4 and 5–9 than reported in the census. Also, the Chief of the Division of Population and Health Statistics of the Central Statistical Administration, R. M. Dmitriyeva, has noted explicitly that there is an undercount of both births and deaths in the Central Asian republics. (Dmitriyeva, "Life Tables," 1970, p. 334.) The extent of such undercounts and the amount of any adjustments made by Soviet officials, if any, are unknown.

TABLE 7.—VITAL RATES: 1950 TO 1971

[Births, deaths, and natural increase per 1,000 population; infant mortality per 1,000 live births]

Year	Birth			Death	Natural increase	Infant mortality
	Total	Urban	Rural			
1950	26.7	26.0	27.1	9.7	17.0	81
1955	25.7	23.5	27.4	8.2	17.5	60
1960	24.9	21.9	27.8	7.1	17.8	35
1961	23.8	21.1	26.5	7.2	16.6	32
1962	22.4	19.9	24.9	7.5	14.9	32
1963	21.1	18.5	24.0	7.2	13.9	31
1964	19.5	17.3	22.1	6.9	12.6	29
1965	18.4	16.1	21.1	7.3	11.1	27
1966	18.2	16.0	20.8	7.3	10.9	26
1967	17.3	15.4	19.8	7.6	9.7	26
1968	17.2	15.3	19.5	7.7	9.5	26
1969	17.0	15.6	18.7	8.1	8.9	26
1970	17.4	16.4	18.7	8.2	9.2	25
1971	17.8	16.9	19.2	8.2	9.6	23

Source: "Nar. khoz. 1922–72," pp. 40, 41.

Fertility

Measured in terms of numbers of births, fertility in the Soviet Union rose fairly steadily during the fifties, from a total of 4,805,000 live births in 1950 to a peak of 5,341,000 in 1960 (app. table I). The annual number then began to drop, and by 1969 the total of 4,087,000 live births represented a decline of nearly one-fourth from the 1960 level. In both 1970 and 1971 the total rose slightly. If these numbers of births are converted to a crude birth rate (births per 1,000 population), a somewhat different fertility trend is obtained. Thus, when divided by a total population that was increasing more rapidly, the rising number of births during the fifties yielded a crude birth rate that decreased slightly—from 26.7 in 1950 to 24.9 in 1960, the year of the peak number of births. Due to the declining number of births in the sixties, the crude birth rate dropped by nearly a third during that decade to 17.0 in 1969. Both of these measures are gross indicators, however, and a more detailed and precise picture of trends in fertility for each of the decades since 1950 is provided by consideration of several other measures.[7]

In the 1950's, at least during the latter half for which data are reported, age-specific fertility rates rose for the two age groups under 25 and declined for the groups in ages 25 and over (table 8).[8] Rates for all age groups were far below those reported for 1938–39, indicating a sharp drop in fertility since before World War II. A summary indicator of these age-specific rates is provided by the general fertility rate, which expresses the number of births per 1,000 women in the reproductive ages. This rate dropped slightly in the mid-fifties but rose to a peak in 1960–61, due to the rise for the two lower age groups and only a slight decrease for the two other prime childbearing age groups, 25 to 29 and 30 to 34 years.

The percent distributions of women in the reproductive ages given in table 8 also shed light on the overall trend of fertility. As indicated by

[7] For an excellent, thoroughgoing analysis of recent trends in fertility rates in the U.S.S.R., see Berent, "Causes," 1970. See also, Heer, "The Demographic," 1968, pp. 203–230.

[8] The fluctuations in the rate for the 15 to 19 age group are largely due to changes in the distribution of the female population by single years of age within the 5-year age group. Most of the births for this age group are to mothers aged 17 to 19; consequently, the rate tends to be low when the number of women aged 17 to 19 is small relative to the total number aged 15 to 19.

these data, the proportion of all women in the reproductive ages who were in the high-fertility ages of 20 to 34 years rose from 45.2 percent in 1950 to 51.5 percent in 1960. The actual number of women in these high-fertility ages increased significantly during the decade, from 24.8 million in 1950 to 27.3 million in 1955 and 30.2 million in 1960 (app. table II). Thus, the increasing numbers of births during these years were due in large part to the increasing number and proportion of women in the prime childbearing ages.

An overall measure of the level of fertility which is not affected by the age structure of the population is the gross reproduction rate. As usually calculated, this rate indicates the replacement potential of the female population in the reproductive ages, and is defined as the number of female children that will be born to 100 women during their reproductive lives if a given set of birth rates by age of mother remains in effect.[9] However, paternal gross reproduction rates, relating male births to the male population of reproductive age, may also be calculated.

TABLE 8.—FEMALE FERTILITY RATES, 1938-39 TO 1970-71, AND PERCENT DISTRIBUTION OF WOMEN IN THE REPRODUCTIVE AGES, 1950 TO 2000

[Rates are number of births per 1,000 women in the specified age group. Rates in parentheses are estimated. Percentages may not add to totals due to rounding. Percent distributions are as of Jan. 1]

Year	15 to 49 years (general fertility rate)	15 to 19 years	20 to 24 years	25 to 29 years	30 to 34 years	35 to 39 years	40 to 44 years	45 to 49 years
Female fertility rates:								
1938-39	139.5	32.8	214.4	230.6	183.5	131.7	68.1	19.0
1950	(87.3)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
1954-55	86.2	15.6	146.9	172.9	127.6	74.4	35.4	7.1
1957-58	86.9	23.9	160.1	166.7	116.4	66.8	24.7	5.7
1958-59	88.7	29.2	162.2	164.8	110.1	66.6	24.1	5.0
1960-61	90.6	35.2	164.8	160.7	110.0	60.7	23.5	4.8
1961-62	87.2	29.6	162.8	155.8	105.2	56.4	22.7	3.8
1962-63	83.2	24.1	162.1	151.4	101.3	54.2	22.3	3.7
1963-64	78.4	22.7	162.6	145.6	97.6	52.0	21.4	3.9
1964-65	73.5	23.7	157.6	138.9	95.5	50.9	20.3	4.2
1965-66	70.8	25.5	159.6	136.0	97.0	50.6	19.1	4.4
1966-67	68.5	26.9	158.6	132.7	97.0	49.2	17.7	4.0
1967-68	66.3	27.7	158.0	129.7	94.7	47.9	16.9	3.8
1969-70	65.7	30.4	163.9	128.7	88.1	48.5	15.3	2.9
1970-71	66.9	32.0	170.2	132.1	87.1	49.6	14.9	2.4
Percent distribution of women (15 to 49):								
1950	100.0	16.3	19.6	14.4	11.2	14.5	12.5	11.5
1955	100.0	18.6	15.1	18.1	13.3	10.3	13.3	11.4
1960	100.0	11.9	18.5	15.0	18.0	13.2	10.2	13.2
1965	100.0	14.5	11.9	18.4	14.7	17.7	13.0	9.9
1970	100.0	17.1	13.4	11.0	17.0	13.4	16.2	11.9
1975	100.0	18.0	16.0	12.5	10.3	15.8	12.4	15.0
1980	100.0	17.3	17.6	15.6	12.2	10.0	15.3	12.0
1985	100.0	14.2	17.0	17.2	15.2	11.9	9.7	14.8
1990	100.0	14.9	14.2	17.0	17.2	15.2	11.8	9.6
1995	100.0	15.6	14.0	13.3	15.9	16.1	14.1	11.0
2000	100.0	16.2	14.7	13.2	12.5	14.9	15.1	13.3

[1] Not available.

Source: Female fertility rates: 1938-39, 1958-59, 1960-61, 1970-71: "Nar. khoz. 1922-72," p. 42. 1950: Computed from data in appendix tables I and II. 1954-55: Starovskiy, "Methods," 1965, p. 249. 1957-58, 1961-62, 1962-63: Nar. khoz. 63, p. 31. 1963-64, 1965-66: Vestnik statistiki, no. 11, 1967, p. 89. 1964-65: "Nar. khoz. 65," p. 44. 1966-67: "Nar. khoz. 67," p. 38. 1967-68, 1969-70: "Vestnik statistiki," No. 12, 1971, p. 75. Percent distribution: Appendix table II and Baldwin, Estimates, 1973, table 4. Figures for 1985-2000 are from series B.

[9] A maternal gross reproduction rate of 100, for example, signifies that 100 women will, during their reproductive lives, give birth to 100 daughters, a rate of 150 signifies that 100 women will bear 150 daughters, etc. Since not all children survive to adulthood and since some that do survive do not marry and raise children, a gross reproduction rate of 100 over a prolonged period would mean ultimately that deaths would exceed births.

Maternal and paternal gross reproduction rates estimated for the Soviet population for the years 1950–71 are shown in table 9. According to the maternal rates, female fertility was relatively stable throughout the 1950's; however, the paternal rates show a significant decline in male fertility during that decade, and suggest that the stability of the maternal rates is illusory. The significance of the decline in the paternal rates has been noted by Brackett and DePauw as follows: [10]

Despite the surface appearance of stability, however, female fertility in the Soviet Union underwent profound changes. Most important is the fact that because fertility of men has declined fertility of married women must also have declined. In 1950, the war-caused deficit of males affected virtually all of the prime reproductive ages. For example, at age 22 there were 12 percent more females than males, at ages 25 to 29, there was a female "excess" of nearly 30 percent, and at ages 30 to 34, there was an excess of 37 percent. Thus, if women married men of their own age, only about two-thirds to three-fourths of the women in the prime reproductive ages could marry even if all men married. The number of unmarried women was undoubtedly higher than these figures imply, however, because women generally marry men somewhat older than themselves and some men prefer to remain single.

Data on the proportions of women married by age group are not reported for any postwar year prior to 1959 and the trend in this factor during the fifties cannot be measured. However, the war-caused deficit of males must have had a decreasing influence on marital opportunities as those cohorts affected by the war became older. By 1959 the deficit affected only those over 30 years of age.

TABLE 9.—ESTIMATED MATERNAL AND PATERNAL GROSS REPRODUCTION RATES: 1950 TO 1971

Year	Gross reproduction rate		Index (1950=100)	
	Maternal	Paternal	Maternal	Paternal
1950	141	213	100	100
1951	142	209	101	98
1952	140	200	99	94
1953	133	185	94	87
1954	143	193	101	91
1955	140	184	99	86
1956	137	177	97	83
1957	138	177	98	83
1958	138	175	98	82
1959	137	172	97	81
1960	138	171	98	80
1961	134	164	95	77
1962	129	154	91	72
1963	126	147	89	69
1964	121	137	86	64
1965	118	130	84	61
1966	120	130	85	61
1967	117	126	83	59
1968	116	127	82	60
1969	115	128	82	60
1970	118	132	84	62
1971	120	136	85	64

Source: Estimated by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. The maternal gross reproduction rates for the years 1950–54 were based on the reported age-specific fertility rates for 1954–55 and the reported total numbers of births for the years 1950–54; those for the years 1955–70 were based on reported births by age of mother; and those for 1971 were based on the reported age-specific fertility rates for 1970–71 and the reported total number of births for 1971. Data relating births to age of the father have not been published. The estimates of the paternal gross reproduction rate were based on the annual number of births by sex reported or estimated for the U.S.S.R. and a pattern of age-specific fertility rates for males. The pattern was derived by multiplying marital fertility rates by age for males in Poland for 1960 by the proportion married at corresponding ages in the U.S.S.R. in 1959. Considerable variation may be obtained in the specific level of the rate by using different patterns of age-specific rates, although the downward trend in male fertility is still evident regardless of the pattern. Also, the abnormal age-sex composition of the population may have produced considerable year-to-year variation in the pattern of age-specific rates for males and in the resulting gross reproduction rate, but not in the general downward trend.

[10] Brackett and DePauw, "Population," 1966, p. 649.

Thus, various and partially countervailing factors were at work in determining the overall trend of Soviet fertility during the 1950's. Increasing numbers of women in the prime childbearing ages and increasing opportunities for marriage led to a rise in numbers of births. Marital fertility clearly declined, however, and on balance the overall indicator of female fertility, the gross reproduction rate, remained fairly stable.

In the 1960's, all measures indicated an overall drop in fertility. Age-specific fertility rates generally declined, although the rates for the two younger age groups, 15 to 19 and 20 to 24, turned up in mid-decade and rose steadily through 1969 (table 8). The general fertility rate, influenced by the sizable decreases in the rates at ages 25 and above, dropped steadily during the decade. The number of women in the high-fertility ages (20–34) dropped from 30.2 million in 1960 to 25.8 million in 1969, and as a proportion of all women in the reproductive ages (15–49) they dropped from 51.5 percent in 1960 to 45.0 percent in 1965 and 41.4 percent in 1969. Both maternal and paternal gross reproduction rates dropped steadily during these years (table 9).

Data on the percent of women married in the Soviet Union in 1959 and 1970, by age group, are given in table 10 with comparable figures for the United States in 1960 and 1970. These data provide a basis for determining trends in marital fertility in the two countries during the decade of the sixties. It is evident from the figures shown that the deficit of males resulted in relatively low percentages of Soviet women married in 1959, especially at ages 30 and over. The percentages for the U.S.S.R. increased at all ages above 15–19 years between 1959 and 1970. A majority of the Soviet percentages for both years were lower than those shown for the United States for comparable years.

TABLE 10.—PERCENT MARRIED, BY AGE, AMONG WOMEN IN THE U.S.S.R., 1959 AND 1970, AND IN THE UNITED STATES, 1960 AND 1970

Age	U.S.S.R.		United States	
	1959	1970	1960	1970
15 to 19 years	[1] 10.0	[1] 8.2	15.1	10.8
20 to 24 years	50.1	55.9	67.2	57.9
25 to 29 years	75.9	82.7	83.4	79.2
30 to 34 years	77.6	85.3	85.9	82.7
35 to 39 years	72.5	83.9	85.4	83.2
40 to 44 years	62.3	79.0	83.3	82.0
45 to 49 years	54.9	71.9	80.0	80.4

[1] Official data for the age group 16 to 19 show 11.2 percent for 1959 and 10.5 percent for 1970. The estimates shown here for the age group 15 to 19 were derived by applying the reported percentages for the age group 16 to 19 to the total female population of those ages and dividing by the estimated number of females aged 15 to 19.

Source: U.S.S.R.: "Izvestiya," Apr. 17, 1971. Population figures for calculation of the rates for the age group 15 to 19 are from single-year-of-age estimates prepared from reported census data, as described in Baldwin, "Estimates," 1973. United States: U.S. Bureau of the Census "U.S. Census of Population, 1960," 1963, pp. 424–425, and——, "Census of Population, 1970," 1972, pp. 3–4.

It is possible to calculate marital fertility rates by dividing age-specific fertility rates by the proportion married at each age.[11] Marital fertility rates for the U.S.S.R. have been computed for 1958–59 and 1969–70 and are shown in table 11 with conventional marital fertility rates for the United States for 1959 and 1968. If illegitimate births

[11] Marital fertility rates computed in this way must be interpreted with care because all births (both legitimate and illegitimate) are attributed to married women. Marital fertility rates are normally calculated by dividing the number of legitimate births to women of a particular age by the number of married women at that age.

were included for the United States, the overall marital fertility rate for ages 15 to 44 would be about 5 percent higher in 1959 and about 10 percent higher in 1968 than those shown. Compared with the United States, marital fertility in the U.S.S.R. was probably a little higher in 1959 but a little lower in the late sixties.

Age-specific marital fertility rates dropped in both countries during the periods shown, except for the age group 15 to 19 where the rates rose markedly. Overall, Soviet marital fertility rates decreased more rapidly than the U.S. rates. Percent changes between 1958–59 and 1969–70 in both age-specific and marital fertility rates for the U.S.S.R are shown in table 12. The decreases for the marital rates were greater than those for the overall rates because the latter were influenced by the rising proportions of all women who were being married and who were therefore subject to having births. Both types of rates dropped more at the older ages.

TABLE 11.—MARITAL FERTILITY RATES, BY AGE, FOR THE U.S.S.R., 1958–59 AND 1969–70; AND FOR THE UNITED STATES, 1959 AND 1968

[Numbers of births per 1,000 married women in the specified age group]

Age	U.S.S.R. 1958–59	United States 1959	United States 1959 as a percent of U.S.S.R. 1958–59	U.S.S.R. 1969–70	United States 1968	United States 1968 as a percent of U.S.S.R. 1969–70
15 to 44 years	174.0	156.2	90	116.2	121.3	104
15 to 19 years	292.0	485.1	166	370.7	496.5	134
20 to 24 years	323.8	346.5	107	293.2	255.2	87
25 to 29 years	217.1	219.6	101	155.6	158.4	102
30 to 34 years	141.9	125.3	88	103.3	81.8	79
35 to 39 years	91.9	63.3	69	57.8	38.9	67
40 to 44 years	[1] 50.5	[2] 17.5	35	[1] 22.6	[2] 11.5	51

[1] Estimated by dividing the number of births to women aged 40 and over by the estimated number of married women aged 40 to 44.
[2] The number of legitimate births to women aged 40 and over per 1,000 married women aged 40 to 44.

Source: U.S.S.R.: Age-specific fertility rates (table 8) divided by the percent married at each age (table 10). Rates were based on all births rather than legitimate births only. United States: U.S. Department of Health, Education, and Welfare, "Vital Statistics 1968," 1970, table 1-7, p. 1–8. Rates were based on legitimate births only.

TABLE 12.—FERTILITY RATES AND MARITAL FERTILITY RATES, BY AGE, FOR THE U.S.S.R.: 1958–59 AND 1969–70

[Fertility rates are numbers of births per 1,000 women. Marital fertility rates are numbers of births per 1,000 married women]

Age	Fertility rates		Percent change, 1958–59 to 1969–70	Marital fertility rates		Percent change, 1958–59 to 1969–70
	1958–59	1969–70		1958–59	1969–70	
15 to 49 years	88.7	65.7	−26	153.0	101.0	−34
15 to 19 years	29.2	30.4	4	292.0	370.7	27
20 to 24 years	162.2	163.9	1	323.8	293.2	−9
25 to 29 years	164.8	128.7	−22	217.1	155.6	−28
30 to 34 years	110.1	88.1	−20	141.9	103.3	−27
35 to 39 years	66.6	48.5	−27	91.9	57.8	−37
40 to 44 years	24.1	15.3	−37	38.7	19.4	−50
45 to 49 years	5.0	2.9	−42	9.1	4.0	−56

Source: Fertility rates: table 8. Marital fertility rates: Age-specific fertility rates (table 8) divided by the percent married at each age (table 10).

Information on fertility levels in the 1970's is still limited, but the data available indicate that the overall downward trend of the sixties has stopped and that fertility has indeed been rising. Age-specific

fertility rates for 1970–71 were higher for ages 15–29 and 35–39 than those for 1969–70, and the general fertility rate rose slightly during the years covered as did the maternal and paternal gross reproduction rates in 1970 and 1971. One possible reason for this recent rise was given by a Soviet demographer: [12]

As is known, the U.S.S.R. Supreme Soviet passed the new Universal Draft Law in 1967, reducing army service from 3 years to 2 and lowering the draft age from 19 to 18. This means that today the soldiers return to civilian life not at age 22 but at age 20. It is obvious that this could not but be reflected in the birth rate. Few people marry before entering the army, but many start families soon after demobilization. In 1969, the 20-year olds ended their army stint for the first time. In 1970 the birth rate increased almost everywhere.

The estimated 1971 maternal gross reproduction rate of 120 for the Soviet Union compares with those of Eastern European countries in that year and of selected countries in the non-Communist world in 1966–68 as follows: [13]

Albania	272	France	129	(1967)
Romania	128	United Kingdom	128	(1967)
Yugoslavia	111	United States	126	(1967)
Poland	109	Italy	122	(1966)
Bulgaria	103	Canada	118	(1968)
Czechoslovakia	103	Belgium	117	(1967)
East Germany	103	Germany, Federal Republic	116	(1968)
Hungary	93	Japan	108	(1967)

Aside from the demographic factors commented on here, the reasons for the decline in fertility in the Soviet Union during the fifties and sixties are many and complex. After an exhaustive survey of the causes of fertility decline in both the Soviet Union and Eastern Europe, Jerzy Berent of the Economic Commission for Europe concluded that "there is sufficient statistical evidence to support the thesis that the fertility differentials normally found in western societies also exist in socialist societies." [14] Factors causing these differentials include urbanization and industralization, which bring higher levels of participation by women in nonagricultural jobs and lessen the need and desire for large families; increased demand and desire for more education, which requires longer periods of schooling; the greater participation of women in political, economic, and cultural activities, and increasing aspiration for higher levels of living; the increasing availability of contraceptive measures, the spread of family planning attitudes, and the relatively easy availability of abortion; significant reduction in infant mortality, which means that a greater proportion of first- and second-order births will survive; and, in the Soviet Union, shortage of housing.[15] The relative importance of each is difficult to measure, but it is evident that Soviet officials and scholars are increasingly determined to collect the necessary data and make an effort to understand the overall processes and isolate the role of each factor.[16]

[12] Perevedentsev, "Prospects," 1972, p. 13.
[13] Baldwin, *Projections . . . Eastern Europe*, 1972, p. 7; Myers, "Demographic," 1970, p. 89; and United Nations, *Demographic Yearbook, 1969*, pp. 474–476.
[14] Berent, "Causes," 1970, p. 278.
[15] Kiseleva, "On the Question," 1970, pp. 143–145. The author discusses various reasons for declines in fertility during the entire Soviet period, plus a number of factors which allegedly operate to increase fertility, such as the elimination of unemployment, the increased number of child-care institutions, etc. See also, Urlanis, "Problems," 1970, pp. 128–135.
[16] Valentey, "Actual," 1969, pp. 54–56. Also, see chapter V, below.

Mortality

Of the two components of the natural increase rate, the death rate has changed by the lesser amount since 1950. Starting at the relatively low level of 9.7 per 1,000 population in that year, the crude death rate dropped to a low of 6.9 in 1964, then gradually increased to 8.2 in 1970—a decline of 15.5 percent over the 20-year period. It remained at 8.2 in 1971.

The crude death rate is an inadequate indicator of trends in mortality by specific age and sex groups, however, and an examination of change at this more detailed level is useful. Tables 13 and 14 present mortality rates per 1,000 population, by age and sex, for selected years since 1938–39; unfortunately, rates for the early fifties are not available. Rates for both sexes for 1938–39 were included to show the significant decreases in mortality at all ages achieved by 1958–59. Rates for 1964–65 include those for the year 1964 when the crude death rate was the lowest of any year reported for the Soviet Union.

The decrease in the rates for ages 0 to 4 has no doubt been largely due to the reduction in infant mortality, which dropped from 167 (deaths under age 1 per 1,000 births) in 1939 to 81 in 1950, 41 in 1958–59, 29 in 1964, and 23 in 1971 (table 7).[17] Since the mid-1960's, rates for both sexes combined in all age groups from 0 to 24 years have either declined or remained at about the same level, while those in all age groups from 25 years on have increased.

[17] Rates for 1939 and 1958–59 are reported in *Nar. khoz. 63*, p. 30.

TABLE 13.—MORTALITY RATES, BY AGE, FOR BOTH SEXES COMBINED, 1938–39 TO 1970–71

[Rates per 1,000 population]

Age group	1938–39	1958–59	1960–61	1962–63	1963–64	1964–65	1966–67	1967–68	1968–69	1969–70	1970–71
All ages	17.4	7.4	7.2	7.4	7.1	7.1	7.5	7.7	7.9	8.2	8.2
0 to 4 years	75.8	11.9	9.9	8.7	7.8	7.2	6.9	7.0	7.0	6.9	6.7
5 to 9 years	5.5	1.1	1.0	.9	.8	.8	.8	.7	.7	.7	.7
10 to 14 years	2.6	.8	.7	.7	.6	.6	.6	.6	.6	.6	.5
15 to 19 years	3.4	1.3	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
20 to 24 years	4.4	1.8	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.6	1.6
25 to 29 years	4.7	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2
30 to 34 years	5.4	2.6	2.7	2.6	2.5	2.5	2.6	2.7	2.8	2.8	2.8
35 to 39 years	6.8	3.1	3.0	3.1	3.1	3.1	3.4	3.5	3.5	3.7	3.8
40 to 44 years	8.1	4.0	3.7	3.8	3.7	3.8	4.1	4.3	4.6	4.7	4.7
45 to 49 years	10.2	5.4	5.4	5.3	5.1	5.0	5.3	5.5	5.6	6.0	6.0
50 to 54 years	13.8	7.9	7.5	7.7	7.7	7.8	7.9	8.0	8.1	8.7	8.7
55 to 59 years	17.1	11.2	10.9	11.2	10.7	10.8	11.3	11.5	12.1	11.7	11.8
60 to 64 years	24.5	17.1	16.6	17.5	17.1	17.2	17.4	17.8	18.2	18.0	17.9
65 to 69 years	35.1	25.2	24.5	25.6	24.1	24.4	25.9	26.3	27.5	27.5	26.9
70 years and over	78.9	63.8	63.1	67.7	63.6	64.2	66.1	66.8	67.3	75.7	74.9

Source: 1938–39, 1958–59, 1966–67: Nar. khoz. 67, p. 38. 1960–61; Nar. khoz. 61, p. 31. 1962–63, 1963–64: Nar. khoz. 64, p. 36. 1964–65: Nar. khoz. 65, p. 44. 1967–68: Vestnik statistiki, No. 6, 1970, p. 91. 1968–69: Vestnik statistiki, No. 2, 1971 p. 90. 1969–70: Nar. khoz. 70, p. 49. 1970–71: Nar. khoz. 1922–72, p. 43.

TABLE 14.—MORTALITY RATES, BY AGE AND SEX: 1958-59 TO 1969-70

[Rates per 1,000 population]

Age group	Male						Female					
	1958-59	1964-65	1966-67	1967-68	1968-69	1969-70	1958-59	1964-65	1966-67	1967-68	1968-69	1969-70
All ages	8.0	7.6	8.0	8.3	8.6	8.8	6.9	6.7	7.0	7.2	7.4	7.6
0 to 4 years	12.6	7.7	7.5	7.6	7.7	7.6	10.8	6.5	6.2	6.3	6.3	6.1
5 to 9 years	1.3	.9	.9	.9	.9	.8	1.0	.7	.6	.6	.6	.6
10 to 14 years	1.0	.7	.7	.7	.7	.7	.7	.5	.5	.4	.4	.4
15 to 19 years	1.6	1.3	1.4	1.4	1.4	1.5	.9	.6	.6	.6	.6	.6
20 to 24 years	2.3	2.1	2.1	2.1	2.1	2.3	1.3	1.0	.9	.9	.8	.8
25 to 29 years	2.9	2.8	3.0	3.2	3.3	3.4	1.5	1.1	1.1	1.1	1.0	1.1
30 to 34 years	3.6	3.7	3.9	4.0	4.2	4.3	1.7	1.4	1.4	1.4	1.4	1.4
35 to 39 years	4.4	4.6	5.0	5.2	5.4	5.6	2.2	1.9	1.9	1.9	1.8	1.9
40 to 44 years	5.8	5.7	6.2	6.6	7.1	7.1	2.9	2.5	2.6	2.6	2.6	2.6
45 to 49 years	7.9	7.5	8.0	8.4	8.8	9.4	3.8	3.5	3.6	3.6	3.7	3.8
50 to 54 years	11.8	11.9	12.1	12.4	12.8	13.7	5.5	5.4	5.4	5.4	5.4	5.7
55 to 59 years	17.9	16.5	17.3	17.8	18.8	18.8	8.1	7.4	7.7	7.8	8.2	7.7
60 to 64 years	25.7	26.2	27.1	27.8	28.1	28.1	12.5	12.6	12.4	12.6	12.7	12.5
65 to 69 years	36.1	36.0	38.1	39.1	41.1	41.2	20.8	18.9	20.2	20.4	21.3	21.1
70 to 74 years	71.4	53.0	56.1	81.0	82.3	91.6	60.3	32.4	33.2	60.7	60.9	68.9
75 to 79 years		73.7	76.3					55.2	55.6			
80 to 84 years		102.2	103.3					83.2	85.5			
85 years and over		160.1	158.8					142.0	140.7			

Source: 1958-59: Estimated by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, from the official Soviet life table for 1958-59 reported in Itogi, 1962, pp. 264-267. 1964-65: Vestnik statistiki, No. 11, 1967, p. 92. 1966-67: Vestnik statistiki, No. 2, 1969, p. 88. 1967-68: Vestnik statistiki, No. 6, 1970, p. 91. 1968-69: Vestnik statistiki, No. 2, 1971, p. 90. 1969-70: Vestnik statistiki, No. 2, 1972, p. 38.

Patterns of change in the rates for males and females generally follow that of both sexes combined, though there are minor variations. Thus, at ages 0 to 4 years the male rate was relatively stable between 1964–65 and 1969–70, whereas the female rate continued to decline. Male rates for ages 5 to 24 years either remained at about the same level or increased, while female rates in these ages generally declined. Male rates for all age groups from 25 years on have increased; female rates for most age groups above 40 increased, although at a slower pace than that of the male rates.

Reasons for the increase in age-specific mortality rates since the middle sixties are not fully known because the published data available on cause of death are relatively scarce. Figures on cause of death, by age and sex for specific diseases within the two major categories of cardiovascular and malignant diseases, have been reported for the years 1967–68, 1968–69, and 1969–70.[18] These data show that for males age-specific death rates due to cardiovascular diseases rose during the 3 years for ages 30 and over, and those due to malignancies rose for ages 40 and over. For females, rates due to cardiovascular diseases increased for ages 40 and over, but decreased at all age groups for deaths due to malignant diseases. The rise in male rates corresponds to increases observed in male age-specific rates for ages 50 and over in a number of European countries between the late 1950's and mid-1960's, notably in Austria, Czechoslovakia, Denmark, East Germany, West Germany, the Netherlands, and Norway.[19]

These changes in the age-specific mortality rates are reflected and summarized in the age-standardized death rates presented in table 15 and in the life expectancies at birth presented in table 16. The age-standardized death rates were obtained by applying age-specific death rates for the years indicated to the population by age and sex from the 1959 census. The standardized rates, which eliminate the effects of the changing age structure of the population, declined until around 1964 and then increased, so that by 1969–70 the mortality level was about the same as it had been a decade earlier. The standardized rates for both males and females have increased since 1964–65, although the increase for males has been larger.

TABLE 15.—AGE-STANDARDIZED DEATH RATES, BY SEX: 1938–39 TO 1970–71

[The population distribution by age and sex from the census of Jan. 15, 1959, was used as the standard population. Rates are per 1,000 population]

Years	Both sexes		Male		Female	
	Crude death rate	Age-standardized death rate	Crude death rate	Age-standardized death rate	Crude death rate	Age-standardized death rate
1938–39	17.4	18.6	(1)	(1)	(1)	(1)
1958–59	7.4	7.4	8.0	8.0	6.9	6.9
1960–61	7.2	7.0	(1)	(1)	(1)	(1)
1962–63	7.4	7.1	(1)	(1)	(1)	(1)
1963–64	7.1	6.7	(1)	(1)	(1)	(1)
1964–65	7.1	6.7	7.6	7.3	6.7	5.9
1966–67	7.5	6.8	8.0	7.5	7.0	6.0
1967–68	7.7	7.0	8.3	7.8	7.2	6.2
1968–69	7.9	7.1	8.6	8.0	7.4	6.2
1969–70	8.2	7.4	8.8	8.4	7.6	6.6
1970–71	8.2	7.4	(1)	(1)	(1)	(1)

[1] Not available.

Source: Population, by age and sex: Baldwin, Estimates, 1973, table 1. Age-specific death rates: Tables 13 and 14.

[18] *Vestnik statistiki*, no. 6, 1970, pp. 92–95, no. 2, 1971, pp. 91–94, and no. 12, 1971, pp. 81–85.

[19] United Nations, *Demographic Yearbook, 1966*, pp. 424–476.

TABLE 16.—EXPECTATION OF LIFE AT BIRTH, BY SEX: 1954–55 TO 1970–71

[In years]

Years	Both sexes	Male	Female	Years	Both sexes	Male	Female
1954–55	64	61	67	1964–65	70	66	74
1955–56	67	63	69	1965–66	70	66	74
1957–58	68	64	71	1966–67	70	66	74
1958–59	69	64	72	1967–68	70	65	74
1960–61	70	65	73	1968–69	70	65	74
1962–63	70	65	73	1970–71	70	65	74
1963–64	70	66	73				

Source: 1954–55: Nar. khoz. 56, p. 270. 1955–56, 1958–59, 1970–71: Nar. khoz. 70, p. 565. 1957–58: Nar. khoz. 59, p. 46. 1960–61, 1962–63, 1965–66: Strana, 1967. p. 260. 1963–64: Nar. khoz. 64, p. 598. 1964–65: Nar. khoz. 65, p. 603. 1966–67: Nar. khoz. 68, p. 600. 1967–68: United Nations, Demographic Yearbook, 1970, p. 728. 1968–69: Nar. khoz. 69, p. 588.

The expectation of life at birth for both sexes in the U.S.S.R. increased from 1954–55 until the mid-1960's, and remained constant thereafter. Males gained 5 years and females gained 7 years between 1954–55 and 1964–65. During the next 6 years, however, males lost a year and females stayed at the same level. The difference of 9 years between the values for the two sexes during the 1960's is clear evidence of a much more favorable mortality pattern for females. The female level in 1970–71 was comparable to those of Eastern European countries and selected countries in the non-Communist world, as the following data show: [20]

Country	Period	Expectation of life at birth (in years)		Country	Period	Expectation of life at birth (in years)	
		Male	Female			Male	Female
East Germany	1967–68	69.2	74.4	France	1969	67.6	75.3
Czechoslovakia	1969	66.2	73.2	Canada	1965–67	68.8	75.2
Poland	1965–66	66.8	72.8	England and Wales	1968–70	68.6	74.9
Bulgaria	1966–67	68.8	72.7	Japan	1968	69.0	74.3
Hungary	1968	66.6	71.9	United States	1969	66.8	74.3
Romania	1968	65.5	69.8	Germany, Federal Republic	1966–68	67.6	73.6
Yugoslavia	1967–68	64.3	68.8	Belgium	1959–63	67.7	73.5
Albania	1965–66	64.9	67.0	Italy	1964–67	67.9	73.4

The male level of 65 years in 1970–71, was lower than recent levels in all other European countries except Albania and Yugoslavia.

The crude death rate will probably increase in future years. As the population gets older, thereby moving relatively more persons into age groups with higher mortality rates, and as the proportion of men in the total population increases, thereby exposing a larger part of the population to the higher male rates, the crude death rate must increase—unless, of course, significant reductions are achieved at many if not all levels. R. M. Dmitriyeva, Chief of the Division of Population and Health Statistics of the Central Statistical Administration, has noted the potential for decreasing mortality in the republics of Central Asia by reducing infant mortality and death from traumatism, cardiovascular diseases, and cancer.[21] This potential may also exist in other

[20] Office of Population Research. *Population Index,* October–December 1972, pp. 516–520.
[21] Dmitriyeva, "Life Tables," 1970, p. 335.

republics. Nationwide mortality rates for certain age groups, and especially infant mortality, may be reduced somewhat and an increase in life expectancy achieved, but the crude rates will probably still rise in the future. The crude death rates associated with the projections presented here rise significantly after 1970, despite an assumed increase in life expectancy (app. table I).

Regional and Ethnic Rates

Vital rates for the republics and economic regions shown in table 17 offer clear evidence of the widely different patterns of population growth among the regions and peoples of the U.S.S.R. Variation of the death rate among the regions is not great—with the exceptions of Estonia and Latvia, where the rates are high because of relatively older populations [22]—and significant differences in natural increase rates result mainly from differences in birth rates.

TABLE 17.—VITAL RATES, BY REPUBLIC AND ECONOMIC REGION: 1960, 1965, AND 1971

[Rates per 1,000 population]

Republic and economic region	1960			1965			1971		
	Birth	Death	Natural increase	Birth	Death	Natural increase	Birth	Death	Natural increase
U.S.S.R.	24.9	7.1	17.8	18.4	7.3	11.1	17.8	8.2	9.6
R.S.F.S.R.	23.2	7.4	15.8	15.8	7.6	8.2	15.1	8.7	6.4
Northwest	20.6	7.5	13.1	14.6	7.9	6.7	(1)	(1)	(1)
Kaliningrad Oblast	24.2	4.7	19.5	16.5	4.7	11.8	(1)	(1)	(1)
Central	18.5	7.8	10.7	12.8	8.4	4.4	(1)	(1)	(1)
Volga-Vyatka	24.6	8.0	16.6	15.9	8.1	7.8	(1)	(1)	(1)
Central-Black Earth	21.8	7.7	14.1	14.2	8.4	5.8	(1)	(1)	(1)
Volga	25.6	7.6	18.0	17.8	7.6	10.2	(1)	(1)	(1)
Northern Caucasus	24.0	7.2	16.8	18.0	7.4	10.6	(1)	(1)	(1)
Urals	25.1	7.3	17.8	16.2	7.2	9.0	(1)	(1)	(1)
Western Siberia	26.7	6.9	19.8	16.2	6.9	9.3	(1)	(1)	(1)
Eastern Siberia	27.7	6.8	20.9	18.5	6.8	11.7	(1)	(1)	(1)
Far East	24.9	6.2	18.7	17.5	6.1	11.4	(1)	(1)	(1)
Ukrainian S.S.R.	20.5	6.9	13.6	15.3	7.6	7.7	15.4	8.9	6.5
Donets-Dnepr	19.9	6.6	13.3	14.2	7.2	7.0	(1)	(1)	(1)
Southwest	21.3	7.2	14.1	16.1	8.0	8.1	(1)	(1)	(1)
South	19.9	6.9	13.0	15.9	7.5	8.4	(1)	(1)	(1)
Belorussian S.S.R.	24.5	6.6	17.9	17.9	6.8	11.1	16.4	7.5	8.9
Uzbek S.S.R.	39.9	6.0	33.9	34.7	5.8	28.9	34.5	5.4	29.1
Kazakh S.S.R.	36.7	6.5	30.2	26.2	5.8	20.4	23.8	6.0	17.8
Georgian S.S.R.	24.7	6.5	18.2	21.0	6.9	14.1	19.0	7.4	11.6
Azerbaydzhan S.S.R.	42.6	6.7	35.9	36.4	6.3	30.1	27.7	6.5	21.2
Lithuanian S.S.R.	22.5	7.8	14.7	18.1	7.9	10.2	17.6	8.5	9.1
Moldavian S.S.R.	29.2	6.4	22.8	20.4	6.2	14.2	20.2	7.7	12.5
Latvian S.S.R.	16.7	10.0	6.7	13.9	10.1	3.8	14.7	11.0	3.7
Kirgiz S.S.R.	36.8	6.1	30.7	31.0	6.4	24.6	31.6	7.0	24.6
Tadzhik S.S.R.	33.5	5.1	28.4	36.5	6.5	30.0	36.8	5.7	31.1
Armenian S.S.R.	40.3	6.8	33.5	29.1	5.8	23.3	22.6	4.9	17.7
Turkmen S.S.R.	42.4	6.5	35.9	37.2	7.0	30.2	34.7	6.7	28.0
Estonian S.S.R.	16.6	10.5	6.1	14.8	10.6	4.2	16.0	10.9	5.1

[1] Not available.

Source: Republican rates: 1960, 1965: "Vestnik statistiki," No. 2, 1971, p. 87. 1971: "Nar. khoz. 1922–72," p. 43. Economic region rates: R.S.F.S.R.: "Nar. khoz. 65," p. 47. Ukrainian S.S.R.: "Narodne 69," p. 29.

In 1971 the highest crude birth rate was reported for the Tadzhik S.S.R.—36.8 per 1,000 population. This rate was over twice the level of the national rate and nearly two and one-half times the rates of 15.1, 15.4, and 14.7, reported for the R.S.F.S.R., the Ukraine, and

[22] In 1959 these two republics had significantly higher proportions of their populations in ages 45 years and over than the other republics. *Itogi*, 1962, pp. 54–55.

Latvia, respectively. Unlike the birth rates for all other republics in the U.S.S.R., the Tadzhik rate did not decline between 1960 and 1971, but actually increased slightly. In general, rates for the Central Asian republics were much higher than those for other republics and they dropped less during the 1960's than those for the western and Transcaucasian republics. Similarly, birth rates of the eastern economic regions of the R.S.F.S.R. are higher than those of the Central European regions for the years shown.

The rates in table 17 do not directly reflect the vital statistics of ethnic groups, since all republics and regions have mixed populations. Analysis of the data in App. table V, however, can provide insights into the rates of natural increase of ethnic groups, wherever they reside, for the intercensal period. Average annual rates of increase between 1959 and 1970 for some of the principal ethnic groups are as follows (in percent):

Estonian	0.2	Armenian	2.3
Latvian	0.2	Kazakh	3.5
Ukrainian	0.8	Azerbaydzhanian	3.7
Russian	1.1	Kirgiz	3.7
Belorussian	1.2	Tadzhik	3.9
Lithuanian	1.2	Turkmenian	3.9
Georgian	1.7	Uzbek	3.9
Moldavian	1.8		

The national average annual rate of increase was 1.3 percent, thus the pattern is clear: increase rates for the Russians and all ethnic groups of western republics except Moldavia were less than the national average; those for the basic ethnic group in Moldavia, Kazakhstan, and the republics of Central Asia and Transcaucasia were above the national average.[23] Rates of increase for the Moslem groups were nearly three times the national level. Continuation of these growth differentials for another decade may well result in the Russian ethnic group decreasing as a proportion of the total, but rough calculations using total population figures projected to January 1, 1980 (app. table I), and based on the assumption that the number of Russians will increase in proportion to the total during the years 1970–80 as it did during the years 1959–70, indicate that the Russian ethnic group will still not fall below 52 percent of the total population by 1980. In any case, there is no direct evidence that this matter is a serious consideration for Soviet policymakers in their discussions of family planning or pronatalist programs.

[23] Rates of increase for Estonians and Latvians were well below the natural increase rates reported for their respective republics in all 3 years shown in table 17, suggesting that the growth rates of other ethnic groups living in these republics were much higher.

IV. Redistribution of the Population, 1959–72

Regional

Published results of the 1970 census have revealed no surprises in respect to change in the distribution of the population among the various regions of the country. In general, the interregional shifts have followed long-term trends,[24] and these were highlighted throughout the intercensal period by population estimates for all major administrative areas published in the annual statistical handbooks, as well as by data on migratory flows published periodically in statistical journals or descriptive monographs. The discussion here will be concerned primarily with the net change in the population of the various regions and administrative areas between 1959 and 1970, and briefly with the role played by migration in this process. The other component of such change, differential natural increase, was discussed in chapter III.

One long-term trend in population shifts that continued throughout the intercensal period was the movement from west to east. Thus, in 1959 there were 45,536,000 persons living east of the Urals in the Asiatic part of Russia, or slightly more than one-fifth (21.8 percent) of the total (table 18). This population increased nearly twice as fast (27.7 percent) as the total during the intercensal period, and in 1970 numbered 58,153,000, or nearly one-quarter (24.1 percent) of the total. Examination of the percent change figures in table 18 reveals the basis for this shift—primarily the high rates of growth in Kazakhstan and the four Central Asian republics. Only one of the economic regions in the eastern part of the R.S.F.S.R.—the Far East region—increased more rapidly than the national total. It is of note that the heavily industrialized Urals region and the Western Siberia region increased at less than half the national rate. Despite the plans to continue developing industrial capacity in these regions, the outflow of population, particularly agricultural, has held down the overall growth of population and labor force.[25]

[24] For a discussion of these trends, see Pokshishevskiy et al., "On Basic," 1970, pp. 318–321.

[25] See "Migration," 1970, II, pp. 2–3.

TABLE 18.—TOTAL POPULATION, BY REPUBLIC AND ECONOMIC REGION: 1959, 1970, AND 1972

[Absolute numbers in thousands]

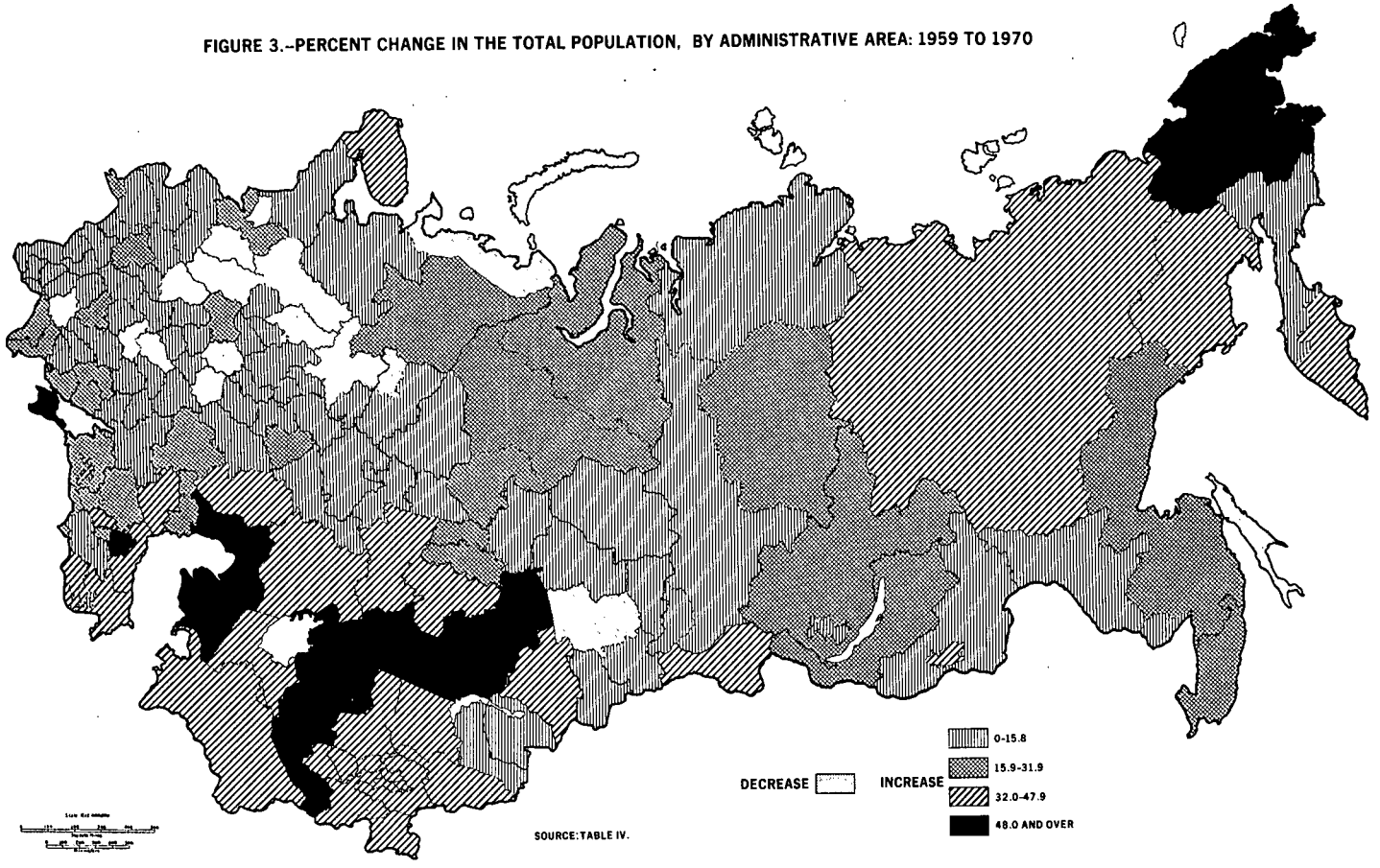
Area, republic, and economic region	1959 (Jan. 15)	1970 (Jan. 15)	1972 (Jan. 1)	Percent change, 1959–70
U.S.S.R	208,827	241,720	246,309	15.8
West (including the Urals)	163,291	183,567	186,091	12.4
West-central part	134,225	147,042	148,474	9.5
R.S.F.S.R.:				
Northwest	10,865	12,157	12,350	11.9
Kalingingrad Oblast	611	732	750	19.8
Central	25,718	27,652	27,871	7.5
Volga-Vyatka	8,252	8,348	8,306	1.2
Central-Black Earth	7,769	7,998	7,925	2.9
Volga	15,975	18,374	18,672	15.0
Urals	14,184	15,185	15,163	7.1
Ukrainian S.S.R.:				
Donets-Dnepr	17,766	20,057	20,369	12.9
Southwest	19,028	20,689	20,924	8.7
Belorussian S.S.R	8,056	9,002	9,142	11.7
Lithuanian S.S.R	2,711	3,128	3,202	15.4
Latvian S.S.R	2,093	2,364	2,409	12.9
Estonian S.S.R	1,197	1,356	1,391	13.3
Southern part	29,066	36,525	37,617	25.7
R.S.F.S.R.: North Caucasus	11,601	14,281	14,641	23.1
Ukrainian S.S.R.: South	5,075	6,380	6,585	25.7
Moldavian S.S.R	2,885	3,569	3,670	23.7
Georgian S.S.R	4,044	4,686	4,789	15.9
Azerbaydzhan S.S.R	3,698	5,117	5,326	38.4
Armenian S.S.R	1,763	2,492	2,606	41.3
East of the Urals	45,536	58,153	60,218	27.7
R.S.F.S.R.:				
Western Siberia	11,252	12,109	12,140	7.6
Eastern Siberia	6,473	7,463	7,579	15.3
Far East	4,834	5,780	6,040	19.6
Uzbek S.S.R	8,119	11,800	12,526	45.3
Kazakh S.S.R	9,295	13,009	13,470	40.0
Kirgiz S.S.R	2,066	2,933	3,074	42.0
Tadzhik S.S.R	1,981	2,900	3,096	46.4
Turkmen S.S.R	1,516	2,159	2,293	42.4

Source: "Nar. khoz. 1922–72," p. 12. Figures reported in this source for the Uzbek and Kazakh Republics differ from those given in app. table IV due to a transfer of territory from the Uzbek to the Kazakh Republic after July 1, 1971, which is not reflected in the figures in app. table IV for 1959 and 1970.

The figures in table 18 also indicate continuation of another long-term trend in population redistribution—from the western and central regions of European Russia to the southern republics and regions. Thus, the North Caucasus region of the R.S.F.S.R., the South region of the Ukraine, Moldavia, and two republics of the Transcaucasus, Azerbaydzhan and Armenia, grew much more rapidly than the country as a whole. Georgia, the other republic in the Transcaucasus, barely kept pace with the national rate.

A graphic indication of these net shifts in population is provided by figure 3. The black and dark markings indicating high rates of increase in Central Asia, the northern parts of the Far East, and the Caucasus stand out, as do the lightly shaded areas showing net loss of population in central European Russia—particularly oblasts in the Volga-Vyatka and Central-Black Earth regions of the R.S.F.S.R.

FIGURE 3.–PERCENT CHANGE IN THE TOTAL POPULATION, BY ADMINISTRATIVE AREA: 1959 TO 1970



SOURCE: TABLE IV.

Official estimates of the population in the various republics and regions as of January 1, 1972, shown in table 18 (and by oblast in App. table IV) indicate trends of change during the 2 years following the recent census. These figures show a generally declining rate of growth in all republics and regions, and an actual loss of population in three regions of Central Russia—Volga-Vyatka, Central-Black Earth, and Urals. The rates of increase in the Central, Volga, and Western Siberia regions of the R.S.F.S.R. and in Lithuania were significantly lower than those recorded for the years between the censuses.

Details of net change in the total population are shown in App. table IV, which gives population figures by republic, kray, and oblast for 1959, 1970, and 1972, plus population density in 1970 and percent change in population during the intercensal period. Of the 160 administrative areas distinguished in this table, 16 lost population during the intercensal period, 71 grew at a rate less than that of the national total, and the remaining 73 grew more rapidly than the total. Ten areas in the latter category increased by more than 50 percent.

Losses in population occurred primarily in oblasts located in those economic regions of central European U.S.S.R. noted above, where agriculture has stagnated and new industries have not been developed. Sakhalin Oblast, where the extractive industry had declined in importance, also lost population, as did most of Altay Kray, an agricultural region. Thus, areas which suffered a net loss during the intercensal years are primarily older, agricultural areas which apparently have little to offer economically.

Only two administrative areas in the R.S.F.S.R., the Chechen Ingush A.S.S.R. in the Northern Caucasus and the Chukot National Okrug of Magadan Oblast in the Far East region, increased by more than half between the censuses. The large increase in the Chechen Ingush A.S.S.R. was due in part to the return of persons deported to the east during World War II, and that in Chukotka was the result of the development of mining for gold and nonferrous metals. The remaining areas with population increases of at least 50 percent were largely in Uzbekistan and Kazakhstan, where both agriculture and industry are developing. Guryev Oblast in Kazakhstan registered the highest rate of increase in these republics, 73.3 percent, the result of both a high rate of natural increase and the development of oil and natural gas deposits. The Crimean Oblast in the Ukraine increased by 51 percent, due largely to the development of irrigation agriculture and natural gas deposits.

Migration played a major role in this net redistribution of population, as it has throughout the Soviet period. Detailed migration statistics are kept as part of the internal passport registration system, but according to the comments of V. V. Pokshishevskiy, a leading Soviet specialist on population geography, the data are incomplete, especially in rural areas, and are poorly processed; therefore, he notes, a general picture of internal migration must be obtained through a "migration balance" method of comparing changes in the total population of regions with the natural increase registered for the same regions.[26] The 1970 census contained three questions designed to obtain information on migration: No. 16, How long has the person lived continuously in this populated place; No. 17, For a person residing here less than 2 years, indicate the place of former residence; and

[26] Pokshishevskiy, "Migration," 1969, pp. 67–75. See also Perevedentsev, "Population" 1967, pp. 144–148.

No. 18, Reason for changing residence. These questions, which are part of a 25-percent sample, will provide data useful for analysis of short-term migration but will be of limited use for the study of migration over the intercensal period.

Utilizing the "migration balance" method, Pokshishevskiy constructed the following picture of net migratory flows between January 15, 1959, and January 1, 1968, among various republics and economic regions of the R.S.F.S.R. (in thousands) : [27]

Territories with a significant predominance of inmigration		*Territories with a significant predominance of outmigration*	
Kazakh S.S.R	1,083	Volga-Vyatka Region	845
Northern Caucasus	764	Central Region	611
Ukrainian S.S.R	419	Urals Region	595
Uzbek S.S.R	409	Central-Black Earth Region	486
Far East	205	Western Siberia	390
Kirgiz S.S.R	201	Belorussian S.S.R	262
Tadzhik S.S.R	161	Eastern Siberia Region	115
Latvian S.S.R	106		

Using data similar to those used by Pokshishevskiy—that is, total population figures and natural increase rates reported, by republic, for each year in the period 1959–69—an intercensal migration balance was computed. Beginning with the 1959 census total for each republic, the reported total population for each year was moved forward 1 year at the natural increase rate (as reported in the republic statistical yearbooks), and the estimated total was subtracted from the reported total to derive an implied net in- or outmigration estimate for the year. These estimated net migration figures were then summed for all years in the period, and a differential between the totals for inmigration and outmigration was distributed among all republics, in proportion to the volume of implied migration in each. The results are as follows (in thousands) :

Republics with implied net inmigration		*Republics with implied net outmigration*	
Kazakh S.S.R	703	R.S.F.S.R.	1,745
Ukrainian S.S.R	429	Belorussian S.S.R	319
Uzbek S.S.R	364	Georgian S.S.R	93
Kirgiz S.S.R	134	Azerbaydzhan S.S.R	44
Tadzhik S.S.R	129		
Armenian S.S.R	124		
Latvian S.S.R	122		
Estonian S.S.R	72		
Moldavian S.S.R	63		
Lithuanian S.S.R	41		
Turkmen S.S.R	20		

These results correspond roughly with Pokshishevskiy's estimates, although the amount of change between 1959 and 1970 is in some cases (particularly for Kazakhstan) of lesser magnitude than Pokshishevskiy's figures for the period 1959–68. In general, both sets of calculations indicate the trends of redistribution discussed above: growth in Kazakhstan, Central Asia, the Ukraine, and Moldavia, and decreases in Belorussia, the central regions of the European R.S.F.S.R., and the Eastern and Western regions of Siberia. It should be noted that the method utilizing intercensal data yields an estimate of migration to Kazakhstan and the republics of Central Asia of 1,350,000, which is only slightly above the figure of 1,200,000 reported for this in-

[27] Pokshishevskiy, "Migration," 1969, pp. 67–75.

migration in the 1970 census results.[28] The implied net inmigration shown for Kazakhstan constitutes 19 percent of the increase in population reported for the republic between the censuses, that for the Ukraine is 8.3 percent, and for the two Baltic republics of Latvia and Estonia, 45 percent—an indication of the need for manpower flows to these latter areas to bolster their low natural increase rates and meet demands for labor. Net interregional migration flows reported for individual years or periods of years during the intercensal period show these same overall trends.[29]

The regional imbalances of manpower which exist in the U.S.S.R. today and the continuing flow of migrants to labor surplus areas (e.g., the North Caucasus and southern Ukraine) are of great concern to Soviet officials and scholars, and increasing attention is now being given to the study of migration: its volume and direction; its causes; the characteristics of migrants; and means of control. The impact of high turnover among migrant workers to Siberia and the North, and the effect on agriculture by the loss of young farm workers to the cities are two problems of significant interest, and much further Soviet research in this area can be expected.[30]

Urban–Rural

The pattern of change in the urban and rural populations of the republics during the years 1959–70 roughly follows that of the total population (table 19). In general, the urban populations of the R.S.F.S.R. and the western republics of the Ukraine, Latvia, and Estonia increased less rapidly than the total urban population, while the rural populations of these republics decreased more rapidly than the total rural population, and both the urban and rural populations of the eastern and southern republics increased significantly.

TABLE 19.—URBAN AND RURAL POPULATION, BY REPUBLIC: 1959, 1970, AND 1972

[Absolute numbers in thousands]

Republic	Urban				Rural			
	1959 (Jan. 15)	1970 (Jan. 15)	1972 (Jan. 1)	Percent change, 1959–70	1959 (Jan. 15)	1970 (Jan. 15)	1972 (Jan. 1)	Percent change, 1959–70
U.S.S.R.	99,978	135,991	142,541	36.0	108,849	105,729	103,768	−2.9
R.S.F.S.R.	61,611	80,981	84,406	31.4	55,923	49,098	47,031	−12.2
Ukrainian S.S.R.	19,147	25,688	26,993	34.2	22,722	21,438	20,885	−5.7
Belorussian S.S.R.	2,481	3,908	4,209	57.5	5,575	5,094	4,933	−8.6
Uzbek S.S.R.	[1] 2,759	[1] 4,362	4,599	[1] 58.1	[1] 5,502	[1] 7,598	7,927	[1] 38.1
Kazakh S.S.R.	[1] 4,037	[1] 6,498	6,942	[1] 61.0	[1] 5,116	[1] 6,351	6,528	[1] 24.1
Georgian S.S.R.	1,713	2,240	2,322	30.8	2,331	2,446	2,467	4.9
Azerbaydzhan S.S.R.	1,767	2,564	2,691	45.1	1,931	2,553	2,635	32.2
Lithuanian S.S.R.	1,046	1,571	1,686	50.2	1,665	1,557	1,516	−6.5
Moldavian S.S.R.	643	1,130	1,224	75.7	2,242	2,439	2,446	8.8
Latvian S.S.R.	1,174	1,477	1,530	25.8	919	887	879	−3.5
Kirgiz S.S.R.	696	1,098	1,164	57.8	1,370	1,835	1,910	33.9
Tadzhik S.S.R.	646	1,077	1,165	66.7	1,335	1,823	1,931	36.6
Armenian S.S.R.	882	1,482	1,589	68.0	881	1,010	1,017	14.6
Turkmen S.S.R.	700	1,034	1,101	47.7	816	1,125	1,192	37.9
Estonian S.S.R.	676	881	920	30.3	521	475	471	−8.8

[1] These figures for the Uzbek and Kazakh S.S.R.'s have not been adjusted to reflect a boundary change between the two republics after the source was published.

Source: "1959, 1970: Vestnik statistiki," No. 2, 1971, pp. 85–86. "1972: Nar. hkoz. 1922–72," pp. 13–18

[28] *Izvestiya*, April 19, 1970.

[29] For example, see interregional data for 1962 and 1961–65 by Perevedentsev and Notkin, as reported in U.S. Congress, Joint Economic Committee, *Soviet*, 1968, pp. 62–63.

[30] See, for example, two recent articles, Ivanova, "On the Development," 1973, pp. 38–48, and Topilin and Gilinskaya, "Regulation," 1973, pp. 121–126, which are concerned with ways to attract manpower to the labor-short eastern regions of the R.S.F.S.R.

Growth of urban population was high in Kazakhstan, the Central Asian republics, and the two republics of the Transcaucasus, Azerbaydzhan and Armenia, as a result of both high rates of natural increase and migration. Urban growth was also at a high level in Belorussia, Lithuania, and Moldavia, where natural increase rates have been low. Chauncy Harris has pointed out that the percentage of the population urban in these latter republics was relatively low in 1959, and that during the intercensal period they experienced an "urban revolution" of high rates of urban growth "sustained by a massive rural-urban migration." [31] Moldavia, which was only 22 percent urban in 1959 (the national population was 48 percent) achieved the highest urban growth rate of 75.7 percent between the censuses. As a result of its rapid increase during the 1960's, the urban population of the Soviet Union comprised 56 percent of the total in 1970, up markedly from 48 percent in 1959.

The rural population in the Central Asian republics grew by more than one-third between 1959 and 1970, that in Azerbaydzhan by nearly one-third, and that in Kazakhstan by nearly one-quarter. A loss in rural population occurred in all of the western republics—the Ukraine, Belorussia, Lithuania, Latvia, and Estonia—and in the R.S.F.S.R. The net loss of nearly 7 million persons from the rural population of the R.S.F.S.R., which occurred largely in the central European and Western Siberia regions, more than matched the gain of rural inhabitants in the eastern republics. Official estimates of both the urban and rural population in each of the republics as of January 1, 1972, given in table 19 show a continuation of the trends observed between the two censuses, although at generally slower rates of change.

Of the 36 million increase in the total urban population during the intercensal period, 14.6 million persons were added due to natural increase, 5 million as a result of converting rural communities into urban places, and "more than" 16 million as the net balance of migrants during the period.[32] Nearly 900 cities and city-type settlements were added to the official list of urban places between the censuses (table 20). In terms of number of places, the size class of 100,000 to 500,000 increased relatively most rapidly—by 53 percent—although the size class under 3,000 added the largest number of places.

Rates of increase among the different size classes of large cities varied considerably in the intercensal period. If cities with populations of 250,000 and more in 1959 are grouped by size class and their populations in 1959 and 1970 compared, it is evident that the total population in these cities grew more slowly than the total urban population (36 percent) and that the largest cities grew most slowly (table 21).

[31] For an excellent discussion of urban growth during these years, see Harris, "Urbanization," 1971, pp. 102–124.

[32] *Izvestiya*, April 19, 1970.

TABLE 20.—NUMBER AND POPULATION OF URBAN PLACES, BY SIZE OF PLACE: 1959, 1970, AND 1972

Size of place	Number of places			Population (millions)		
	1959 (Jan. 15)	1970 (Jan. 15)	1972 (Jan. 1)	1959 (Jan. 15)	1970 (Jan. 15)	1972 (Jan. 1)
All places	4,619	5,504	5,589	100.0	136.0	142.5
500,000 and more	[1] 25	33	34	[1] 24.2	37.3	39.4
100,000 to 500,000	123	188	197	24.4	38.3	41.0
50,000 to 100,000	156	188	199	11.0	13.0	13.7
20,000 to 50,000	474	599	607	14.8	18.5	18.8
10,000 to 20,000	798	920	944	11.2	12.7	13.2
5,000 to 10,000	1,296	1,430	1,468	9.2	10.0	10.3
3,000 to 5,000	904	1,024	1,032	3.6	4.1	4.1
Under 3,000	843	1,122	1,108	1.6	2.1	2.0

[1] There are discrepancies between the number of cities of 500,000 or more and the total of their populations in 1959 as given here and the equivalent figures in tables 21 and 22, based on a later official source. The latter figures indicate 24 cities with a population of 25,400,000.

Source: 1959, 1970: "Izvestiya," Apr. 19, 1970. 1972: "Nar. khoz. 1922–72," p. 29.

TABLE 21.—INCREASE IN POPULATION OF LARGE CITIES: 1959 TO 1970

[Absolute numbers in thousands. As of Jan. 15]

Size of city in 1959	Number of cities	Population		Increase, 1959–70	
		1959	1970	Number	Percent
All cities	58	36,838	48,099	11,261	30.5
1,000,000 and more	3	10,475	12,659	2,184	20.8
750,000 to 1,000,000	7	6,259	8,275	2,016	32.2
500,000 to 750,000	14	8,708	11,721	3,013	34.6
250,000 to 500,000	34	11,396	15,444	4,048	35.5

Source: Table 22.

Assuming that the natural increase in these large cities during the intercensal period was 14.6 percent, as reported for the total urban population (see above), the proportion of the increase for each size class that was due to migration can be computed as: cities of 1,000,000 and more—29.5 percent; cities of 750,000 to 1,000,000—54.6 percent; cities of 500,000 to 750,000—57.9 percent; and cities of 250,000 to 500,000—58.9 percent. The natural increase rate for these cities was probably less than the overall 14.6 percent, and the role played by migration was probably even more significant than indicated.

There were 10 cities with more than 1 million inhabitants in 1970, compared with only three—Moscow, Leningrad, and Kiev—in 1959 (table 22). Moscow and Leningrad remain far above the other cities in terms of population, but the more rapid growth of the other cities in this size class—particularly Kiev and Tashkent—has reduced the relative differences in size. The official policy of limiting the growth of Moscow and Leningrad has been only moderately effective, as both cities grew more rapidly than the nation as a whole.

The city which grew most rapidly during the intercensal period was Bratsk, the site of a hydroelectric station on the Angara River in Eastern Siberia (not listed in table 22). It grew from 43,000 in 1959 to 155,000 in 1970, an increase of 259 percent. The second largest growth rate was registered by Tolyatti (formerly Stavropol), the site of a large hydroelectric station on the Volga and of the new automobile plant constructed by Fiat. It increased from 72,000 in

1959 to 251,000 in 1970, a rise of 249 percent. Other cities which grew rapidly include Frunze (96 percent), Lipetsk (84 percent), Minsk (80 percent), Tyumen (79 percent), and Ulyanovsk (70 percent). One city listed in table 22 lost population during the intercensal period and also during the 1970–72 period—Prokopyevsk, a coal mining center in the Kuzbas of Western Siberia.[33]

TABLE 22.—POPULATION OF CITIES WITH 250,000 INHABITANTS OR MORE IN 1970: 1959, 1970, AND 1972

[Absolute numbers in thousands. In comparable boundaries]

City	Jan. 15, 1959	Jan. 15, 1970	Jan. 1, 1972	Percent increase, 1959–70
Moscow	6,044	7,077	7,300	17.1
Leningrad	3,321	3,950	4,066	18.9
Kiev	1,110	1,632	1,764	47.0
Tashkent	927	1,385	1,461	49.4
Baku	968	1,266	1,314	30.8
Kharkov	953	1,223	1,280	28.3
Gorkiy	941	1,170	1,213	24.3
Novosibirsk	885	1,161	1,199	31.2
Kuybyshev	806	1,045	1,094	29.7
Sverdlovsk	779	1,025	1,073	31.6
Minsk	509	917	996	80.2
Odessa	664	892	941	34.3
Tbilisi	703	889	927	26.5
Donetsk	708	879	905	24.2
Chelyabinsk	689	875	910	27.0
Kazan	667	869	904	30.3
Dnepropetrovsk	661	862	903	30.4
Perm	629	850	881	35.1
Omsk	581	821	876	41.3
Volgograd	591	818	852	38.4
Rostov-on-Don	600	789	823	31.5
Ufa	547	771	821	41.0
Yerevan	493	767	818	55.6
Saratov	579	757	790	30.7
Riga	580	732	755	26.2
Alma-Ata	456	730	776	60.1
Voronezh	447	660	693	47.7
Zaporozhye	449	658	697	46.5
Krasnoyarsk	412	648	688	57.3
Krivoy Rog	401	573	600	42.9
Lvov	411	553	579	34.5
Karaganda	383	523	541	36.6
Yaroslavl	407	517	538	27.0
Novokuznetsk	382	499	508	30.6
Krasnodar	313	464	491	48.2
Tula	351	462	478	31.6
Irkutsk	366	451	473	23.2
Vladivostok	291	441	472	51.5
Barnaul	303	439	459	44.9
Khabarovsk	323	436	462	35.0
Frunze	220	431	452	95.9
Izhevsk	285	422	456	48.1
Ivanovo	335	420	434	25.4
Zhdanov	284	417	435	46.8
Astrakhan	305	410	427	34.4
Makeyevka	371	392	396	5.7
Kemerovo	289	385	404	33.2
Voroshilovgrad	275	383	404	39.3
Nizhniy Tagil	338	378	383	11.8
Dushanbe	227	374	400	64.8
Penza	255	374	395	46.7
Vilnius	236	372	400	57.6
Magnitogorsk	311	364	373	17.0
Tallin	282	363	378	28.7
Kishinev	216	356	395	64.8
Ulyanovsk	206	351	382	70.4
Ryazan	214	350	378	63.6
Kalinin	261	345	367	32.2
Orenburg	267	344	370	28.8
Arkhangelsk	258	343	355	32.9
Groznyy	250	341	355	36.4
Tomsk	249	338	360	35.7
Gorlovka	308	335	337	8.8
Kirov	252	333	349	32.1
Nikolayev	235	331	353	40.9

[33] Harris, "Urbanization," 1971, pp. 119–124, and ———, *Cities*, 1970, pp. 297–400.

TABLE 22.—POPULATION OF CITIES WITH 250,000 INHABITANTS OR MORE IN 1970: 1959, 1970, AND 1972—Con.

[Absolute numbers in thousands. In comparable boundaries]

City	Jan. 15, 1959	Jan. 15, 1970	Jan. 1, 1972	Percent increase, 1959–70
Bryansk	207	318	338	53.6
Murmansk	222	309	329	39.2
Kaunas	219	305	322	39.3
Kaliningrad	204	297	315	45.6
Lipetsk	157	289	312	84.1
Kursk	205	284	301	38.5
Prokopyevsk	282	274	270	−2.8
Gomel	168	272	297	61.9
Tyumen	150	269	291	79.3
Samarkand	196	267	278	36.2
Kherson	158	261	283	65.2
Taganrog	202	254	265	25.7
Ulan-Ude	174	254	269	46.0
Ashkhabad	170	253	266	48.8
Tolyatti	72	251	333	248.6

Source: "Nar. khoz," 1922–72, pp. 20–28.

V. Population Policy

The sizable drop in the annual number of births during the 1960's and the increasingly clear indication that age-specific fertility is decreasing has induced much open concern on the part of Soviet planners, scholars, and the public. Officials of the Central Statistical Administration no doubt were aware of this impending development by the middle or late 1950's, and it may well have been a prime reason for their taking a sample survey of fertility in 1960, utilizing families in the panel for the monthly household budget survey.[34] An increasing number of journal articles and monographs has been devoted to the general topic of fertility decline and the question of a need for an official population policy. In the latter half of the decade and continuing into the early seventies a number of nationwide and regional conferences and symposiums devoted to these topics have been held. The popular press has not ignored the matter, particularly the literary weekly, *Literaturnaya gazeta*, which has sponsored many articles by well-known scholars and actively solicited the views of readers.[35]

Numerous surveys designed to determine desired and actual size of family have been conducted in recent years by various academic or research institutions. For example, in 1966 the Demographic Laboratory of the Scientific Research Institute, Central Statistical Administration, conducted a survey of 1,462 women employed in several light industry enterprises in Moscow. The results of this survey included the following data:[36]

[34] Sifman, Darskiy, and Bondarskaya, "Methods." 1967, pp. 11–23. A limited amount of data from this survey of specific cohorts of women was published in *Vestnik statistiki*, no. 8, 1967, pp. 87–95.

[35] For summaries of these articles see the article by the prominent Soviet demographer, B. Urlanis, in *Literaturnaya gazeta*, May 1, 1968, p. 12; an unsigned article in the issue of August 13, 1969, p. 12; and an article by Valentey and Kiseleva, "The Cradle." March 17, 1971.

[36] Belova and Darskiy, "The Opinions," 1968, p. 29.

Desired number of children:	*Percent of respondents who indicated this number*
0	1.7
1	34.9
2	58.9
3 and over	4.5
Total	100.0

These figures, for female workers in the metropolitan Moscow area, show that well over one-third of the respondents wanted only one or no children, and 95.5 percent wanted two or less.

A survey conducted by the Laboratory for the Study of Population Problems of Moscow State University gave varying results for different types of areas far from Moscow: [37]

Area	Number of children desired	Number of children actually in the family
Novgorod Oblast: Okulovskiy Rayon	2.5	1.7
Chuvash A.S.S.R.:		
Marinskiy-Posad City	2.5	1.9
Marisko-Posad Rayon (rural areas)	3.3	2.7
Yal'chinskiy rural rayon	3.4	3.4

The desired number of children in all areas was, as could be expected, significantly higher than that cited above for the city of Moscow, and even higher in rural areas. A survey of 14,000 women taken in Latvia in 1967–68 indicated the desired number of children to be 1.78, whereas the actual number was 1.39. In urban areas of the Republic these numbers were 1.68 and 1.29, respectively, and in rural areas they were 2.07 and 1.68.[38]

In 1969, the Scientific Research Institute of the Central Statistical Administration conducted a nationwide fertility survey, using as a basis a sample of 250,000 families of workers and employees which had been selected for a survey on income and housing conditions in 1967. A questionnaire was mailed to half (60,852) of the married women under 40 in this sample, and a total of 35,602 were returned—some 55 percent of the number sent out. The results of this survey, which were described by V. Belova in an article in *Vestnik statistiki* in June 1971, show, in detail by republic and economic region within the R.S.F.S.R. and the Ukraine, the ideal and expected numbers of children indicated by the respondents.[39]

In the country as a whole, the average ideal number of children was 2.89; the range by republic varied from 2.60 for Latvia to 2.69 for the R.S.F.S.R. and 4.55 for Uzbekistan. In the Northwest economic

[37] Valentey, "Actual," 1969, p. 55.
[38] Zvezdov et al., "Problems," 1969, p. 22.
[39] Belova, "Investigations," 1971, pp. 23–34. Many of the tabular results of this survey are given in Heer, "Recent," 1972, pp. 260–261.

region of the R.S.F.S.R., which includes Leningrad, the ideal number was 2.50, the lowest shown. The average expected number of children per family for the country as a whole was 2.42, somewhat lower than the ideal. The range of expected numbers by republic varied from 2.07 in the Ukraine to 2.21 in the R.S.F.S.R. and 4.31 in Uzbekistan; this number was lowest in the central economic region of the R.S.F.S.R., which surrounds Moscow. As these figures indicate, the results of the survey reported by Belova show a clear differentiation among the republics and regions: the republics of Central Asia, Kazakhstan, and the Caucasus show relatively high values for the ideal expected number of children; the European regions of the R.S.F.S.R. and the other republics in the European part of the country show relatively low values.

The problem of interpreting data such as these and evaluating current trends in fertility is being given serious attention by many researchers and officials in the Soviet Union today. Total size of population, per se, is not of concern, but the long-term implications for the numbers of potential mothers and of entrants into the workforce are of deep concern. Since its earliest years the Soviet regime has paid little attention to population policy, for until recently its labor supply was ample and at no time has there been a problem of overpopulation. The taut labor supply which existed throughout most of the sixties prompted the current study and evaluation of demographic trends, however, and prospects for continuation of this scarcity may well instigate positive action on population matters in the future.

Explicit actions taken in the past by the Soviet Government in the realm of population policy have related to abortions and a system of allowances and awards to mothers with large families. Under Lenin's direction abortion was legalized in 1920, and during that decade the ratio of abortions to births rose rapidly, reaching 2.71 in 1934. By 1936, in consideration of the declining birth rate and the possible shortage of future soldiers, the government prohibited abortions except those performed to protect the health of the mother or to prevent the birth of a child with a possible hereditary defect.[40] The birth rate rose markedly in the late 1930's and rose again to relatively high levels in the early 1950's. In 1955 a decree was passed repealing the prohibition on abortion, ostensibly to "permit the limitation of the harm caused to the health of women by abortions carried out outside of hospitals."[41] The decree stipulated that abortions must be performed only by qualified personnel in medical installations. This decree, which is still in effect today, did not cause an immediate and sudden decline in the birth rate, presumably in large part due to the sizable number of illegal abortions which had been performed previously. It was undoubtedly a factor in the decline of fertility in the ensuing years, however.[42]

Under current regulations, an abortion is not to be performed if the health of a woman is endangered or if a previous pregnancy was terminated within the preceding 6 months. David has summarized other circumstances relating to the obtaining of abortions by Soviet women:

[40] The discussion of abortions here is based largely on: David, *Family*, 1970, pp. 41–49; Field, "The Re-Legalization," 1956, pp. 421–427; Heer, "Abortion," 1965, pp. 76–83; and ———, "The Demographic," 1968, pp. 230–240.
[41] Field, "The Re-Legalization," 1956, p. 426.
[42] David, *Family*, 1970, p. 46.

It is now the usual practice that a gynecologist discusses with each woman the reasons for her application for abortion and warns her of possible adverse consequences. In cases of social difficulty, a lawyer is consulted. If the pregnant woman persists in her request for abortion, her application must be approved. Termination is performed in a hospital, with a minimum 3-day's stay. The vacuum aspiration method is widely used. Anesthesia is rarely given. Cost for an induced abortion is 5 rubles or $5.50. Therapeutic abortions are free. Mortality and morbidity are low. Although women are expected to go to the maternity center in their locality, they frequently travel to a larger town in an effort to conceal their abortion. . . . The impression persists that Soviet physicians continue to oppose abortion in principle but have accepted it as a lesser evil than illegal abortion.[43]

Soviet health officials have kept detailed statistics on the numbers of abortions performed both inside and outside medical institutions,[44] but no figures or rates for the country as a whole have been published. Using data reported by the Soviet specialist on abortion statistics, Ye. A. Sadvokasova, Heer has calculated that the number of abortions performed in the 12-month period "centering on January 1959 can then be estimated as 5,829,000. The corresponding number of births can be closely estimated to be 5,242,000." [45] The East German specialist in abortion research, Karl-Heinz Mehlan, estimated in 1968 that the number of legal abortions was 6 million per year.[46] Whatever the number, it apparently is high, and the abortion rate may well be one of the highest in the world.

Although Soviet women are able to obtain an abortion upon request, medical authorities openly comment on its harmful consequences on the health of a woman and even campaign to reduce its incidence.[47] Various types of contraceptive devices are available in the Soviet Union, including the pill and the IUD, though the condom reportedly is the most widely used.[48] Nevertheless, the use of these devices apparently is not widespread, and abortion is used as the surest method of preventing the birth of an unwanted child. The prominent Soviet demographer, D. I. Valentey, recently argued openly against reinstituting a ban on abortions on the grounds that "a woman who does not want a baby will not have it" and that banning of legal abortions would only increase the incidence of criminal abortions, with all the health hazards which that would entail.[49]

The system of allowances and awards for mothers with large families was instituted in 1936, in conjunction with the ban on abortions, when provisions were made for payment of a yearly cash sum to mothers who had seven or more children. This program was revised drastically in 1944 by the establishment of a schedule of increasing lump-sum payments for third and higher order births, monthly allowances for each child in the fourth and higher order from the second through fifth years of life, and a series of medals and awards beginning with the

[43] *Ibid.*
[44] Sadvokasova, *Sotsial'no-*, 1969, p. 117.
[45] Heer, "Abortion," 1965, pp. 80–81. If Heer's estimate is taken for the calendar year 1959 (it presumably would be somewhat high, as the incidence of abortion was probably still increasing) and linked to a series of annual percent increase figures reported by Sadvokasova (*Sotsial'no-*, 1969, p. 117), it can be estimated that in 1955 there were 2,367,000 abortions (5,047,000 reported live births), and that in 1965 there were 7,791,000 abortions (4,253,000 reported live births). These estimates of abortions may be high, but they indicate the approximate level. The respective abortion and live birth rates per 1,000 persons indicated by these figures are 12.1 and 25.7 for 1955 and 33.7 and 18.4 for 1965.
[46] Mehlan, "Abortion," 1970, p. 307.
[47] Hyde, "Abortion," 1970, p. 291; Sadvokasova, *Sotisial'no-*, 1969, pp. 120–136; and Serenko, *Prepodavaniye*, 1969, pp. 34–35.
[48] Heer, "Abortion," 1965, p. 82, and David, *Family*, 1970, pp. 52–53.
[49] *New York Times*, March 23, 1971.

birth of the fifth child. Unmarried mothers also received these allowances, plus monthly payments for their first three children until they reached age 12. The amounts of these payments and allowances were cut in half as of the beginning of 1948 and the resulting structure of payments is still used.[50]

Payments and allowances given to mothers with large families under the system operating from 1944 through 1947 may have been designed as a pronatalist program, but none of the decrees establishing or changing the various systems has been openly described by the Soviet Government as intended to stimulate an increase in the birth rate. Also, the average amount of the sums paid under the 1936 and the post-1948 systems seems unlikely to have been, or at present to be, enough to spur an increase in the birth rate. In 1969, for example, 438 million rubles were paid to 3,377,000 mothers with four or more children, plus an unknown number of unmarried mothers.[51] Ignoring the number in this latter category, these figures indicate an average yearly allowance of 130 rubles for each mother with a large family. This is less than 10 percent of the annual average wage of 1,403 rubles for all workers and employees in the economy, and less than 12 percent of the average wage of 1,118 rubles for workers and employees on State farms.[52] Bachelors and childless couples pay a special tax of slightly more than 6 percent on their income; this tax was introduced in 1941 along with other wartime measures for raising revenues and, although revised several times since, is still in force.[53]

In sum, explicit actions by the Soviet Government relating to population policy have been limited in the past, and at present there is no clear outline of a conscious and defined policy. There is much evidence that a number of scholars in academic and research circles are interested in a rise in fertility. For example, a report on a symposium held in Cheboksary in 1968 on the general subject of regional differences in population growth indicates that nearly all participants "expressed the opinion that it was necessary to conduct an active population policy aimed at creating optimal reproduction conditions." Noting that such a policy must be differentiated to account for the great variations in fertility among the regions of the country, the report stressed that emphasis was given at the symposium to the belief that the prohibition of legal abortions would be impermissible.[54] Valentey, stressing the need to consider the complex "social-psychological situation" which governs the desires for children, suggests a number of measures which would stimulate a rise in fertility, including: (1) increasing the privileges available to women who have children, such as extending the length of post-confinement maternity leave (maternity leave is now 56 days pre- and 56 days post-confinement), reducing the length of the working day for women with children under 3 years of age, and granting additional vacation time, with pay, to mothers with children under 14 years of age; (2) eliminating payments for use of child-care facilities by families with low income; and (3) considering the work by a mother in caring for children under 3 years of age as regular employment. Valentey also suggests that money to pay for

[50] Dodge, *Women*, 1966, pp. 23–25, and Heer, "The Demographic," 1968, pp. 233–234.
[51] *Vestnik statistiki*, no. 1, 1971, p. 92.
[52] *Nar. khoz. 69*, p. 539.
[53] Gallik, Jesina, and Rapawy, *The Soviet*, 1968, p. 135.
[54] Kiseleva, "Population," 1968, pp. 153–155.

such proposals as these could come, at least in part, by eliminating the payments and allowances to mothers with large families and to unmarried mothers.[55]

Whether or not the Soviet Government will act on the many proposals such as these is problematical. Payments for the use of child-care institutions have been reduced for low-income families; and as a result of discussion at the 24th Congress of the Soviet Communist Party, an income supplement will be initiated for low-income families in 1974 to bring their per capita income up to 50 rubles a month.[56] Both of these actions appear to be designed as welfare measures, however, and not as stimulants to the birth rate. In view of the widespread concern over the reduction of fertility, especially as it relates to adequate numbers of future entrants into the labor force, some positive action, other than imposing a ban on abortion, seems likely. Nevertheless, there are deterrent factors to a pronatalist program, primarily economic in nature, which may lead to a continued policy of inaction. These factors include greater expenditures for allowances to mothers with large families; meeting demands for more housing; fulfilling needs for additional child-care and medical facilities; and losing the participation of potential mothers in the labor force.[57]

An interesting sidelight to the discussions being held in Soviet academic and official circles on population policy is a spirited controversy over the position that demography should hold in the hierarchy of scholarly and scientific endeavors. Several symposiums have been devoted to this topic, and there have been numerous articles in journals, particularly in *Vestnik statistiki*, the official journal of the Central Statistical Administration. One school of thought, which is small in number but highly vocal, is represented by P. G. Pod"yachikh, former Deputy Chief of the Central Statistical Administration and head of the All-Union Census Department in that Administration. Pod"yachikh maintains, in essence, that demography cannot be considered a science and can better be called "population statistics" and considered a branch of statistics, which is a "universal research method." This viewpoint has been strongly and openly disputed by most prominent demographers in the country—including A. Ya. Boyarskiy, Ya. N. Guzevatyy, D. I. Valentey, B. Ts. Urlanis, and B. Ya. Smulevich—who argue that demography can and should be considered a science. Both sides invoke Lenin, Engels, and other Marxist writers freely to support their contentions. At stake in this dispute may well be the degree of influence which leaders in the recent renaissance of demographic research in the Soviet Union will have on official policymaking. All indications are that their position is gaining more and more official support.[58]

VI. Future Growth of the Population

Based on a population distribution by age and sex derived from data reported for the census of January 15, 1970, the Foreign Demographic Analysis Division has prepared four series of projections, by

[55] Valentey, "Actual," 1969, p. 58. See also, ———, "On Demographic," 1972.
[56] Urlanis, B., "Pressing," 1971, pp. 29–35. See also, Bush, "Higher," 1972.
[57] See Heer, "The Demographic," 1968, p. 240.
[58] For a summary of this controversy see Ter-Izreal'yan and Dubnov, "A Discussion," 1969, pp. 71–79. See also Pod'yachikh, "Statistics," 1969, pp. 45–56, and Valentey, "On the Question," 1969, pp. 34–41.

single years of age and sex, for each year from 1972 to 2001.[59] These series differ as a result of varying assumptions about future fertility: series A assumes an increase in the level of fertility, series B assumes constant fertility at the level estimated for 1971, and series C and D assume declining fertility. Appendix tables I, II and III present details from these projections for selected years to 2001. Years ending in one and six were selected to be consistent with the current 5-year plan period which began on January 1, 1971, and continues to January 1, 1976. Trends in the totals and in the age-sex structures of these four series of projected populations are discussed below, followed by a brief description of the methodology used in preparing the projections.

Total Population

According to the projections presented here, the population of the U.S.S.R. is expected to number between 293 million and 352 million by the year 2001 (table 23). The size of the future population will be determined primarily by the trend in fertility. If fertility remains at the 1971 level, as assumed by projection series B, the total population is expected to be about 322 million by the year 2001. This figure represents an increase of 78 million over the total of 244 million for 1971, or an average increase of 2.6 million per year. If fertility declines at the rate assumed for series C, the population will be more than 307 million by the year 2001, or 64 million more than the 1971 total. Series D, which provides for a more rapid decline in fertility, shows a population of 293 million by the year 2001, or only 49 million more than the 1971 population. The series C and D projections imply average annual increases of 2.1 million and 1.6 million, respectively, over the 30-year period. On the other hand, series A assumes a rise in fertility and indicates a population of about 352 million by 2001. This represents an increase of almost 108 million between 1971 and 2001, or an average gain of 3.6 million per year.

TABLE 23.—ESTIMATED AND PROJECTED TOTAL POPULATION: 1971 TO 2001

[In thousands. As of Jan. 1]

Year	Projection series			
	A	B	C	D
1971	[1] 243,873			
1976	258,332	256,274	255,246	254,219
1981	275,866	269,878	266,894	263,910
1986	295,685	284,433	278,827	273,222
1991	314,430	297,865	289,618	281,366
1996	332,400	310,096	299,079	288,075
2001	351,598	321,862	307,401	293,151

[1] This figure differs slightly from the corresponding figure shown in App. table II. See note 3 to App. table I.

Source: App. table I. Projected totals for 2001 are from App. table II.

The projected growth rates for the total population during the various 5-year periods from 1971 to 2001 are higher during the first 15 years than they are during the last 15 years (table 24). The series

[59] The estimates and projections presented here are consistent with those given in Baldwin, *Estimates*, 1973. They supersede all other estimates and projections for the U.S.S.R. prepared previously by the Foreign Demographic Analysis Division, including those given in Brackett and DePauw, "Population," 1966, and Baldwin, *Projections . . . U.S.S.R.*, 1969.

B, C, and D projections also indicate less numerical increase after 1986 than between 1971 and 1986. The largest numerical increase for all projections except series D will be in the period 1981–85 when the numbers of women in the prime reproductive ages of 20 to 29 years (birth cohorts of the fifties and early sixties) rise to a peak. This will also be the period with the highest growth rates for the series A and B projections, but not for the other two projection series where declining fertility patterns are assumed. At no time are the projected growth rates as high as those shown for the 5-year periods from 1950 to 1965 (table 2), although the rates for the series A projections are higher than the growth rates during the previous 5-year plan period (1966 through 1970).

During the current 5-year plan period (1971 through 1975), the total population is expected to increase by between 10.3 and 14.5 million, depending on the level of fertility, and by 1976 it should number between 254 and 258 million. These projected figures represent increases of from 4 to 6 percent for the entire 5-year period, or average rates of 0.8 to 1.2 percent yearly.

TABLE 24.—PROJECTED GROWTH OF THE TOTAL POPULATION: 1971 TO 2001

[Absolute numbers in thousands]

Item	1971–75	1976–80	1981–85	1986–90	1991–95	1996–2000
Series A	14,459	17,534	19,819	18,745	17,970	19,198
Series B	12,401	13,604	14,555	13,432	12,231	11,766
Series C	11,373	11,648	11,933	10,791	9,461	8,322
Series D	10,346	9,691	9,312	8,144	6,709	5,076
Overall (percent):						
Series A	5.9	6.8	7.2	6.3	5.7	5.8
Series B	5.1	5.3	5.4	4.7	4.1	3.8
Series C	4.7	4.6	4.5	3.9	3.3	2.8
Series D	4.2	3.8	3.5	3.0	2.4	1.8
Annual average (percent):						
Series A	1.2	1.3	1.4	1.2	1.1	1.1
Series B	1.0	1.0	1.1	.9	.8	.7
Series C	.9	.9	.9	.8	.6	.5
Series D	.8	.8	.7	.6	.5	.3

Source: Table 23.

Age-Sex Structure

Table 25 and App. table III present data from the four projection series for selected age groups. The number of children in the preschool ages of 3 to 6 years, which rose to a peak in the mid-1960's following the high birth years of the late 1950's and early 1960's, will decline steadily until 1974, after which it will rise again until 1991. After 1991 the number is likely to decline again—only series A indicates a larger figure in 2001 than in 1991. During the current 5-year plan period the potential demand for kindergarten facilities will continue to be low. This pattern of change will be somewhat echoed by the population in the school ages of 7 to 18 years, which increased to a peak of 58.5 million in 1972, and is projected to drop off considerably by the first half of the 1980's, then start to rise again and continue increasing until 2001. The overall requirements for facilities and teachers at the elementary and secondary school levels will therefore be declining from the present time until the early to middle eighties.

Males in the prime military ages of 18 to 34 years have been gradually increasing in number since the mid-1960's and this slow increase will continue through the current 5-year plan period. The number will increase much more rapidly during the late seventies and by 1986 there will be almost 40 million males in these ages. Following this the size of the cohort will decline until 1991. The trend after 1991 varies according to the series; series A indicates a rise, series B shows a continued decline followed by a rise during the late 1990's; and series C and D both show decreasing numbers until 2001.

TABLE 25.—PROJECTED GROWTH OF THE POPULATION IN SELECTED AGE GROUPS: 1971–2001

[Absolute numbers in thousands]

Age group and series	1971–75	1976–80	1981–85	1986–90	1991–95	1996–2000
Kindergarten ages (3 to 6):						
A	190	4,005	3,351	1,397	−547	841
B	−240	1,926	2,046	912	−551	−52
C	−454	892	1,393	668	−543	−390
D	−668	−142	738	425	−530	−632
School ages (7 to 18):						
A	−2,504	−3,814	4,254	10,410	7,029	2,349
B		−4,725	968	5,554	4,374	1,178
C		−5,178	−664	3,139	3,054	594
D		−5,629	−2,299	719	1,716	36
Males of military ages (18 to 34):						
A	1,642	6,604	1,159	−993	318	3,390
B				−1,211	−1,192	1,092
C				−1,319	−1,936	−55
D				−1,425	−2,683	−1,204
Able-bodied ages (16 to 54/59):						
A	12,849	10,728	2,944	4,479	7,690	14,200
B				3,039	4,115	9,161
C				2,328	2,355	6,649
D				1,616	576	4,140
Older ages (55/60 and over)	2,559	2,962	5,463	5,315	6,053	2,389

Source: App. table III.

The population in the able-bodied ages will increase by over 23 million (18 percent) between 1971 and 1981. During the current 5-year plan this age group will increase by 12.8 million, and during the next 5-year period (1976 through 1980) it will rise by 10.7 million. The projected increases for the 1980's are very much smaller and those for the 1990's are also less than those expected during the present decade. The number of males in these ages will increase more rapidly than the comparable number of females over the projected period.[60]

By far the most significant change in the age structure of the population will occur in the older, or pension, ages. Between 1971 and 2001 this age group will increase by 24.7 million, or 67 percent. The number of males will rise by 124 percent, and the number of females by 47 percent. Despite these increases, however, the dependency ratio will drop from 835 in 1971 to between 687 and 763 in 1981, after which it will rise again to 783–937 in 1996. All four series show a small decrease in the ratio between 1996 and 2001. The decline in this ratio through 1981 occurs primarily because of the large increase in the size of the population in the able-bodied ages.

As noted in chapter II, the excess of females over males in the total population will continue to drop over the projection period, from 18.8 million in 1971 to about 13 to 14 million in 2001. The sex ratio will rise

[60] For detailed data on the population in the able-bodied ages, see the paper by Feshbach and Rapawy in this volume.

from 85.7 to about 92 during this period. The longtime deficit of males in the able-bodied ages will be eliminated by 1981. In the older ages females will continue to outnumber males, and the sex ratio for these ages of 53 males per 100 females at the end of the century will still be excessively low.

Projection Methodology

The projections presented here were prepared by the cohort-component method, which entails moving forward a reported or estimated distribution of the population, by age and sex, to future years on the basis of various assumptions concerning the components of population change (births, deaths, and migration).[61] The cohort-component method was also used to prepare estimates for earlier years by projecting the population distribution by age and sex backward from the base year.

The base populations for these estimates and projections were two estimated distributions by single years of age and sex which were derived from the 1959 and 1970 census results. The one for January 15, 1959, is a revision of an estimated distribution by sex and single years of age for that date prepared previously by the Foreign Demographic Analysis Division.[62] The one for January 15, 1970, was based on the revised distribution for 1959 as well as on the population by 5-year age groups and sex reported for the 1970 census.[63] Both base populations were adjusted pro rata to equal the estimated population totals for the beginning of those years. With a few minor exceptions, the distributions by age and sex for the years 1950 to 1972 were prepared by using the official figures for total population, births, and deaths shown in App. table I following the text.

The distributions for the years 1950 to 1958 were obtained by a reverse projection of the base population for January 1, 1959. The survival rates used in the reverse projection were derived from the official Soviet life table for 1958–59, reported infant mortality rates for the years 1950 to 1959, and estimated changes in the mortality pattern by age and sex as calculated from model life tables prepared by Coale and Demeny.[64] These model life tables are divided into four regional families—North, South, East, and West. Each family represents a different pattern of age-specific mortality and was based on the mortality experience of various countries of the world. The survival rates by age and sex for each year from 1950 to 1958 were derived by adjusting the rates from the 1958–59 life table according to the pattern of change by age and sex implied by different levels of the West family of model life tables. The overall amount of change was determined by the level of infant mortality for each year relative to the level for 1958 and 1959. The population distributions by age and sex for the years 1950 to 1958 vary from those previously published by this Division [65] due to the use of the revised base population for 1959 as well as to the use of different survival rates, population totals, and vital statistics.

[61] For a more retailed description of the methodology used to prepare these estimates and projections, see Baldwin, *Estimates*, 1973, pp. 5–14.
[62] The distribution prepared previously was presented in Brackett, *Projections*, 1964, pp. 17–22.
[63] Reported in *Nar. khoz. 70*, pp. 13–14.
[64] Coale and Demeny, *Regional*, 1966.
[65] Brackett and DePauw, "Population," 1966, pp. 662–666.

The age-sex distributions for the years 1960 to 1969 were derived as weighted averages of two sets of projections for the intercensal years. The first set was obtained by projecting the January 1, 1959, base population forward to 1970, and the second set was obtained by a reverse projection of the January 1, 1970, base population back to 1959. The survival rates used for these two sets of projections were derived from official life tables and death rates by age and sex reported for various years of the intercensal period. The weights used in averaging the two series were calculated separately for each set of projections as follows: weights for the first set were proportions expressing the part of the 11-year intercensal period, 1959 to 1970, remaining in each year—i.e., the weight for 1960 was 10/11, that for 1961 was 9/11, etc.; weights for the second, reverse, set of projections were derived in the same manner, but based on the period 1970 to 1959—i.e., the weight for 1969 was 10/11, that for 1968 was 9/11, etc. Thus, for example, the final age-sex distribution for 1965 was calculated by multiplying each age-sex group of the 1965 distribution projected from the 1959 base population by 5/11, and by multiplying each age-sex group of the 1965 distribution projected from the 1970 base population by 6/11, and then adding the two products. This procedure was designed to yield reasonable results for all years in the intercensal period but it could not eliminate certain inconsistencies in the reported data, particularly between census results for 1959 and those for 1970 and between vital statistics for the 1960's and the census results for 1970.

The distributions for the years 1970 to 2001 were projected from the base population for January 1, 1970. The 1970 distribution was updated to January 1, 1972, by using reported and estimated data on births, deaths, and total population. The 1972 distribution was projected to the year 2001 on the basis of various assumptions regarding fertility, mortality, and migration. Migration was assumed to be negligible over the entire projection period, despite the fact that in recent years there has been some emigration of Jews. The numbers involved—about 15,000 for 1971 and approximately 30,000 for 1972—have been relatively small, however, and the future course of this emigration is uncertain.

Four series of projections were prepared. These series differ as a result of varying assumptions about future fertility. The series A projections assume an increase in the level of fertility; the series B projections assume constant fertility at the current level; and the series C and D projections assume declining fertility. The assumptions for each series were represented by an assumed maternal gross reproduction rate for each year in the projection period. These rates were used to adjust recently reported female age-specific fertility rates, which, in turn, were applied to the female population in the reproductive ages to give the projected numbers of births.

The fertility assumptions are given in table 26, both as ratios of the estimated 1971 gross reproduction rate (which is the way the assumptions were formulated) and in terms of the gross reproduction rates those ratios imply. Ratios for the years 1973–81 were obtained by interpolation between the projected rates for 1972 and 1982; those for 1983–2000 were held constant at the 1982 level.

TABLE 26.—ESTIMATED AND ASSUMED GROSS REPRODUCTION RATES: 1950 TO 2000

Year and series	Gross reproduction rate	Ratio of the estimated or assumed rate to that for 1971
1950	141	1.17
1955	140	1.17
1960	138	1.15
1965	118	0.98
1970	118	.98
1971	120	1.00
1972:		
A	132	1.10
B	120	1.00
C	114	.95
D	108	.90
1982–2000:		
A	144	1.20
B	120	1.00
C	108	.90
D	96	.80

Only one assumption was made about the future course of mortality, namely that it will decrease at a modest rate throughout the projection period. Mortality was assumed to decline such that life expectancy at birth would increase by 2.5 years between 1971 and 2000. This was accomplished by using the families of life tables prepared by Coale and Demeny. The family of life tables was selected that most closely matched estimated survival rates by age and sex for 1971. The rates for 1971 were estimated by adjusting survival rates derived from recently published mortality rates, by age and sex, to yield the estimated number of deaths for 1971. The selection of the family of tables was made separately for each sex. For males the West family, and for females the North family, most closely matched the estimated 1971 survival rates. For each sex, two sets of survival rates were derived from the selected family of tables. The first set was chosen such that the associated life expectancy would be equal to the estimated 1971 life expectancy as calculated from the adjusted survival rates for 1971. The second set was selected on the basis of an associated life expectancy 2.5 years higher than that estimated for 1971. The implied changes by age between the two sets were then used to adjust the estimated survival rates for 1971 to produce the rates for 2000. The life expectancies associated with the survival rates for 1971 and 2000 are shown in table 27. Survival rates for the intervening years were calculated by interpolating between the rates for 1971 and those for 2000. These rates were used to calculate the numbers of deaths, by age and sex, for each year in the projection period.

TABLE 27.—ESTIMATED AND PROJECTED LIFE EXPECTANCIES AT BIRTH, BY SEX: 1950 TO 2000

[In years]

Year	Male	Female
ESTIMATES		
1950	57.8	65.5
1955	62.2	70.4
1960	65.9	74.2
1965	66.2	74.8
1970	64.4	73.9
1971	65.3	75.1
PROJECTIONS		
2000	67.8	77.6

Appendix Tables

TABLE I.—ESTIMATED AND PROJECTED TOTAL POPULATION, COMPONENTS OF POPULATION CHANGE AND VITAL RATES: 1950 TO 2000

[Absolute numbers in thousands; rates per 1,000 populaton. Differences between natural increase and year-to-year changes in the population estimates are due, in varying degrees, to migration and discrepancies in the reporting systems. Natural increase may not equal the difference between births and deaths due to rounding. See text for an explanation of the series]

Year	Population [1]		Natural increase [2]		Births [2]		Deaths [2]	
	January 1	July 1	Number	Rate	Number	Rate	Number	Rate
ESTIMATES								
1950	178,547	180,075	3,060	17.0	4,805	26.7	1,745	9.7
1951	181,603	183,191	3,177	17.3	4,954	27.0	1,777	9.7
1952	184,778	186,378	3,199	17.1	4,948	26.5	1,749	9.4
1953	187,977	189,491	3,030	16.0	4,754	25.1	1,724	9.1
1954	191,004	192,710	3,420	17.7	5,135	26.6	1,715	8.9
1955	194,415	196,159	3,435	17.5	5,047	25.7	1,613	8.2
1956	197,902	199,658	3,505	17.6	5,023	25.2	1,517	7.6
1957	210,414	203,170	3,579	17.6	5,164	25.4	1,585	7.8
1958	204,925	206,806	3,749	18.1	5,240	25.3	1,491	7.2
1959	208,686	210,529	3,661	17.4	5,265	25.0	1,604	7.6
1960	212,372	214,329	3,812	17.8	5,341	24.9	1,529	7.1
1961	216,286	218,145	3,629	16.6	5,192	23.8	1,563	7.2
1962	220,003	221,730	3,292	14.9	4,959	22.4	1,667	7.5
1963	223,457	225,063	3,131	13.9	4,758	21.2	1,627	7.2
1964	226,669	228,149	2,875	12.6	4,457	19.5	1,581	6.9
1965	229,628	230,936	2,563	11.1	4,253	18.4	1,690	7.3
1966	232,243	233,533	2,351	10.9	4,242	18.2	1,711	7.3
1967	234,823	235,994	2,294	9.7	4,093	17.3	1,799	7.6
1968	237,165	238,317	2,254	9.5	4,088	17.2	1,833	7.7
1969	239,468	240,554	2,130	8.9	4,087	17.0	1,957	8.1
1970	[3] 241,640	242,757	2,229	9.2	4,226	17.4	1,996	8.2
1971	[3] 243,873	245,091	2,356	9.6	4,372	17.8	2,016	8.2
PROJECTIONS								
Series A								
1972	[3] 246,309	[4] 247,735	2,861	11.5	4,865	19.6	2,004	8.1
1973	[5] 249,161	250,639	2,956	11.8	5,014	20.0	2,058	8.2
1974	252,117	253,646	3,058	12.1	5,166	20.4	2,108	8.3
1975	255,175	256,754	3,157	12.3	5,326	20.7	2,169	8.4
1976	258,332	259,966	3,268	12.6	5,489	21.1	2,221	8.5
1977	261,600	263,294	3,387	12.9	5,658	21.5	2,271	8.6
1978	264,987	266,737	3,500	13.1	5,832	21.9	2,332	8.7
1979	268,487	270,300	3,625	13.4	6,008	22.2	2,383	8.8
1980	272,112	273,989	3,754	13.7	6,182	22.6	2,428	8.9
1981	275,866	277,799	3,866	13.9	6,348	22.9	2,482	8.9
1982	279,732	281,720	3,975	14.1	6,500	23.1	2,525	9.0
1983	283,707	285,710	4,006	14.0	6,573	23.0	2,567	9.0
1984	287,713	289,717	4,008	13.8	6,616	22.8	2,608	9.0
1985	291,721	293,703	3,964	13.5	6,625	22.6	2,661	9.1
1986	295,685	297,642	3,913	13.1	6,609	22.2	2,696	9.1
1987	299,598	301,511	3,826	12.7	6,574	21.8	2,748	9.1
1988	303,424	305,296	3,743	12.3	6,530	21.4	2,787	9.1
1989	307,167	308,995	3,656	11.8	6,487	21.0	2,831	9.2
1990	310,823	312,627	3,607	11.5	6,453	20.6	2,846	9.1
1991	314,430	316,215	3,570	11.3	6,434	20.3	2,864	9.1
1992	318,000	319,782	3,563	11.1	6,438	20.1	2,875	9.0
1993	321,563	323,351	3,575	11.1	6,469	20.0	2,894	9.0
1994	325,138	326,944	3,611	11.0	6,524	20.0	2,913	8.9
1995	328,749	330,575	3,651	11.0	6,600	20.0	2,949	8.9
1996	332,400	334,256	3,711	11.1	6,695	20.0	2,984	8.9
1997	336,111	337,994	3,766	11.1	6,803	20.1	3,037	9.0
1998	339,877	341,796	3,837	11.2	6,922	20.3	3,085	9.0
1999	343,714	345,664	3,899	11.3	7,053	20.4	3,154	9.1
2000	347,613	349,606	3,985	11.4	7,194	20.6	3,209	9.2
Series B								
1972	[3] 246,309	[4] 247,518	2,426	9.8	4,423	17.9	1,997	8.1
1973	[5] 248,726	249,962	2,471	9.9	4,517	18.1	2,046	8.2
1974	251,197	252,456	2,518	10.0	4,613	18.3	2,095	8.3
1975	253,715	254,995	2,559	10.0	4,713	18.5	2,154	8.4
1976	256,274	257,581	2,613	10.1	4,815	18.7	2,202	8.5
1977	258,887	260,220	2,666	10.2	4,920	18.9	2,254	8.7
1978	261,553	262,912	2,717	10.3	5,028	19.1	2,311	8.8
1979	264,270	265,658	2,775	10.4	5,135	19.3	2,360	8.9
1980	267,045	268,462	2,833	10.6	5,238	19.5	2,405	9.0
1981	269,878	271,317	2,877	10.6	5,335	19.7	2,458	9.1
1982	272,755	274,214	2,918	10.6	5,416	19.8	2,498	9.1
1983	275,673	277,142	2,937	10.6	5,478	19.8	2,541	9.2
1984	278,610	280,076	2,932	10.5	5,513	19.7	2,581	9.2
1985	281,542	282,988	2,891	10.2	5,522	19.5	2,631	9.3
1986	284,433	285,855	2,843	9.9	5,508	19.3	2,665	9.3
1987	287,276	288,657	2,761	9.6	5,477	19.0	2,716	9.4
1988	290,037	291,377	2,679	9.2	5,438	18.7	2,759	9.5
1989	292,716	294,016	2,600	8.8	5,398	18.4	2,798	9.5
1990	295,316	296,591	2,549	8.6	5,362	18.1	2,813	9.5
1991	297,865	299,115	2,499	8.4	5,332	17.8	2,833	9.5

See footnotes at end of table.

TABLE I.—ESTIMATED AND PROJECTED TOTAL POPULATION, COMPONENTS OF POPULATION CHANGE AND VITAL RATES: 1950 TO 2000—Continued

Year	Population [1]		Natural increase [2]		Births [2]		Deaths [2]	
	January 1	July 1	Number	Rate	Number	Rate	Number	Rate
1992	300,364	301,598	2,467	8.2	5,313	17.6	2,846	9.4
1993	302,831	304,051	2,440	8.0	5,303	17.4	2,863	9.4
1994	305,271	306,483	2,424	7.9	5,304	17.3	2,880	9.4
1995	307,695	308,896	2,401	7.8	5,313	17.2	2,912	9.4
1996	310,096	311,290	2,388	7.7	5,332	17.1	2,944	9.5
1997	312,484	313,666	2,363	7.5	5,359	17.1	2,996	9.6
1998	314,847	316,025	2,356	7.5	5,394	17.1	3,038	9.6
1999	317,203	318,368	2,330	7.3	5,437	17.1	3,107	9.8
2000	319,533	320,698	2,329	7.3	5,488	17.1	3,159	9.9
Series C								
1972	[3] 246,309	[4] 247,409	2,209	8.9	4,202	17.0	1,993	8.1
1973	[5] 248,509	249,623	2,228	8.9	4,269	17.1	2,041	8.2
1974	250,737	251,861	2,248	8.9	4,336	17.2	2,088	8.3
1975	252,985	254,116	2,261	8.9	4,406	17.3	2,145	8.4
1976	255,246	256,389	2,286	8.9	4,478	17.5	2,192	8.5
1977	257,532	258,687	2,309	8.9	4,551	17.6	2,242	8.7
1978	259,841	261,004	2,326	8.9	4,625	17.7	2,299	8.8
1979	262,167	263,343	2,351	8.9	4,699	17.8	2,348	8.9
1980	264,518	265,706	2,376	8.9	4,767	17.9	2,391	9.0
1981	266,894	268,087	2,385	8.9	4,828	18.0	2,443	9.1
1982	269,279	270,476	2,393	8.8	4,875	18.0	2,482	9.2
1983	271,672	272,875	2,405	8.8	4,930	18.1	2,525	9.3
1984	274,077	275,275	2,396	8.7	4,961	18.0	2,565	9.3
1985	276,473	277,650	2,354	8.5	4,969	17.9	2,615	9.4
1986	278,827	279,981	2,308	8.2	4,957	17.7	2,649	9.5
1987	281,135	282,250	2,230	7.9	4,929	17.5	2,699	9.6
1988	283,365	284,441	2,152	7.6	4,893	17.2	2,741	9.6
1989	285,517	286,555	2,075	7.2	4,855	16.9	2,780	9.7
1990	287,592	288,605	2,026	7.0	4,819	16.7	2,793	9.7
1991	289,618	290,605	1,973	6.8	4,787	16.5	2,814	9.7
1992	291,591	292,558	1,933	6.6	4,758	16.3	2,825	9.7
1993	293,524	294,471	1,893	6.4	4,735	16.1	2,842	9.7
1994	295,417	296,345	1,856	6.3	4,715	15.9	2,859	9.6
1995	297,273	298,176	1,806	6.1	4,699	15.8	2,893	9.7
1996	299,079	299,961	1,763	5.9	4,689	15.6	2,926	9.8
1997	300,842	301,697	1,709	5.7	4,686	15.5	2,977	9.9
1998	302,551	303,384	1,666	5.5	4,689	15.5	3,023	10.0
1999	304,217	305,022	1,610	5.3	4,699	15.4	3,089	10.1
2000	305,827	306,614	1,574	5.1	4,715	15.4	3,141	10.2
Series D								
1972	[3] 246,309	[4] 247,301	1,992	8.1	3,981	16.1	1,989	8.0
1973	[5] 248,292	249,285	1,986	8.0	4,020	16.1	2,034	8.2
1974	250,278	251,267	1,978	7.9	4,059	16.2	2,081	8.3
1975	252,256	253,238	1,963	7.8	4,100	16.2	2,137	8.4
1976	254,219	255,199	1,959	7.7	4,141	16.2	2,182	8.6
1977	256,178	257,154	1,951	7.6	4,182	16.3	2,231	8.7
1978	258,129	259,097	1,936	7.5	4,223	16.3	2,287	8.8
1979	260,065	261,029	1,927	7.4	4,262	16.3	2,335	8.9
1980	261,992	262,951	1,918	7.3	4,295	16.3	2,377	9.0
1981	263,910	264,856	1,892	7.1	4,321	16.3	2,429	9.2
1982	265,802	266,736	1,867	7.0	4,334	16.2	2,467	9.2
1983	267,669	268,606	1,874	7.0	4,383	16.3	2,509	9.3
1984	269,543	270,473	1,860	6.9	4,410	16.3	2,550	9.4
1985	271,403	272,313	1,819	6.7	4,418	16.2	2,599	9.5
1986	273,222	274,109	1,773	6.5	4,406	16.1	2,633	9.6
1987	274,995	275,844	1,698	6.2	4,381	15.9	2,683	9.7
1988	276,693	277,506	1,625	5.9	4,348	15.7	2,723	9.8
1989	278,318	279,092	1,548	5.5	4,313	15.5	2,765	9.9
1990	279,866	280,616	1,500	5.3	4,277	15.2	2,777	9.9
1991	281,366	282,089	1,446	5.1	4,244	15.0	2,798	9.9
1992	282,812	283,511	1,397	4.9	4,209	14.8	2,812	9.9
1993	284,209	284,883	1,347	4.7	4,174	14.7	2,827	9.9
1994	285,556	286,203	1,293	4.5	4,139	14.5	2,846	9.9
1995	286,849	287,462	1,226	4.3	4,103	14.3	2,877	10.0
1996	288,075	288,656	1,162	4.0	4,070	14.1	2,908	10.1
1997	289,237	289,780	1,085	3.7	4,043	14.0	2,958	10.2
1998	290,322	290,832	1,019	3.5	4,020	13.8	3,001	10.3
1999	291,341	291,810	937	3.2	4,002	13.7	3,065	10.5
2000	292,278	292,715	873	3.0	3,990	13.6	3,117	10.6

[1] The Jan. 1 population figures for the years 1950–58, 1960–69, and 1971–72 are official Soviet estimates. The figures for the beginning of 1959 and 1970 are estimates based on the Jan. 15, 1959, and Jan. 15, 1970, census totals, respectively. The July 1 estimates for all years are averages of the adjacent Jan. 1 estimates.

[2] All of the rates and the absolute numbers of births and deaths shown for the years 1950–71 are reported except the numbers of deaths for the years 1951, 1953–54, and 1956–57, which were estimated from the official rates.

[3] The Jan. 1 population figures for 1970, 1971, and 1972 given here differ slightly from the corresponding figures of 241,635,000, 243,896,000, and 246,300,000 as shown in app. table II. The latter estimates were used in preparing the projections and are consistent with the age-sex distributions presented in app. table II, whereas the figures shown in this table were revised after the projections were completed. The estimate for the beginning of 1970 was adjusted slightly to accord more closely with the official estimates for the years 1969–71, and those for the beginning of 1971 and 1972 are revised official estimates.

[4] The official estimate for July 1, 1972 is 247,451,000.

[5] The official estimate for Jan. 1, 1973 is 248,600,000.

Source: Baldwin, "Estimates," 1973.

TABLE II.—ESTIMATED AND PROJECTED POPULATION, BY 5-YEAR AGE GROUPS AND SEX: 1950 TO 2001

[Numbers in thousands as of Jan. 1. Figures may not add to totals due to rounding. See text for an explanation of the series]

Series and age	1950	1955	1960	1965	1970	1971	1972	1973	1974	1975	1976	1981	1986	1991	1996	2001
BOTH SEXES																
All ages:																
A	178,547	194,415	212,372	229,628	[1] 241,635	[1] 243,896	[1] 246,300	249,161	252,117	255,175	258,332	275,866	295,685	314,430	332,400	351,598
B								248,726	251,197	253,715	256,274	269,878	284,433	297,865	310,096	321,862
C								248,509	250,737	252,985	255,246	266,894	278,827	289,618	299,079	307,401
D								248,292	250,278	252,256	254,219	263,910	273,222	281,366	288,075	293,151
Under 5 years:																
A	18,010	22,889	24,613	24,372	20,526	20,418	20,440	21,144	21,997	23,010	24,094	28,495	31,960	31,997	31,870	34,087
B								20,709	21,077	21,550	22,036	24,553	26,673	26,636	26,079	26,561
C								20,492	20,617	20,820	21,008	22,586	24,033	23,965	23,260	23,080
D								20,275	20,158	20,091	19,981	20,616	21,396	21,290	20,483	19,788
5 to 9 years:																
A	14,244	17,511	22,538	24,694	24,495	23,385	22,411	21,509	20,799	20,368	20,269	23,926	28,315	31,768	31,828	31,709
B												21,880	24,391	26,513	26,490	25,954
C												20,863	22,440	23,888	23,838	23,143
D												19,849	20,486	21,271	21,173	20,384
10 to 14 years:																
A	21,887	14,147	17,434	22,387	24,869	25,316	25,625	25,565	25,175	24,449	23,339	20,232	23,886	28,269	31,722	31,790
B													21,845	24,355	26,478	26,458
C													20,830	22,408	23,856	23,809
D													19,816	20,455	21,242	21,145
15 to 19 years:																
A	17,683	21,709	14,080	17,314	22,154	22,726	23,179	23,721	24,538	24,792	25,235	23,259	20,167	23,813	28,189	31,640
B														21,778	24,286	26,422
C														20,774	22,361	23,810
D														19,767	20,414	21,201
20 to 24 years:																
A	20,311	17,475	21,570	13,969	17,118	18,894	20,167	21,078	21,336	22,036	22,604	25,103	23,137	20,064	23,701	28,065
B															21,673	24,177
C															20,674	22,263
D															19,673	20,332
25 to 29 years:																
A	13,213	20,014	17,298	21,432	13,780	12,205	11,642	12,713	14,880	16,977	18,744	22,429	24,916	22,969	19,922	23,543
B																21,526
C																20,532
D																19,537
30 to 34 years	10,102	12,995	19,785	17,011	21,161	21,663	21,318	18,914	15,943	13,620	12,066	18,541	22,187	24,660	22,744	19,739
35 to 39 years	13,066	9,899	12,825	19,487	16,606	16,166	16,249	17,842	19,651	20,855	21,353	11,895	18,287	21,892	24,343	22,458
40 to 44 years	11,346	12,737	9,721	12,609	19,018	19,460	19,499	18,353	17,137	16,278	15,855	20,955	11,677	17,965	21,518	23,941
45 to 49 years	9,841	10,987	12,506	9,467	12,266	13,522	14,954	16,617	17,790	18,537	18,968	15,458	20,446	11,397	17,553	21,035
50 to 54 years	7,942	9,438	10,672	12,385	9,085	8,948	9,183	9,770	10,697	11,850	13,069	18,293	14,909	19,745	11,010	16,989
55 to 59 years	6,305	7,476	9,033	10,370	12,022	11,636	11,021	10,245	9,382	8,649	8,526	12,470	17,402	14,188	18,811	10,495
60 to 64 years	5,236	5,777	6,926	8,591	9,780	10,062	10,369	10,691	10,997	11,207	10,848	7,959	11,661	16,206	13,211	17,556
65 to 69 years	3,882	4,614	5,171	6,077	7,828	8,015	8,184	8,358	8,586	8,761	9,023	9,751	7,165	10,531	14,552	11,866
70 to 74 years	2,632	3,231	3,888	4,331	5,005	5,349	5,703	6,044	6,358	6,662	6,823	7,688	8,335	6,142	9,066	12,444
75 years and over	2,847	3,516	4,312	5,132	5,922	6,131	6,356	6,597	6,851	7,124	7,516	9,412	11,235	12,824	12,360	14,241

All ages:																	
A								115,303	116,854	118,460	120,123	129,410	139,930	149,935	159,399	169,382
B	78,382	86,563	95,962	104,941	111,355	112,553	113,808	115,081	116,385	117,717	119,075	126,356	134,193	141,489	148,025	154,225
C								114,970	116,150	117,343	118,549	124,834	131,331	137,279	142,403	146,843
D								114,859	115,915	116,970	118,024	123,315	128,480	133,078	136,793	139,580
Under 5 years:																	
A								10,761	11,201	11,728	12,281	14,531	16,305	16,331	16,276	17,417
B	9,181	11,677	12,580	12,431	10,443	10,391	10,400	10,539	10,732	10,985	11,233	12,520	13,610	13,596	13,318	13,573
C								10,428	10,497	10,611	10,707	11,518	12,261	12,233	11,879	11,794
D								10,317	10,262	10,238	10,182	10,512	10,916	10,867	10,461	10,110
5 to 9 years:																	
A												12,180	14,423	16,190	16,231	16,181
B	7,193	8,890	11,478	12,584	12,485	11,920	11,420	10,954	10,584	10,351	10,298	11,137	12,424	13,515	13,508	13,245
C												10,617	11,429	12,173	12,158	11,808
D												10,104	10,436	10,843	10,796	10,403
10 to 14 years:																	
A												12,152	14,391	16,158	16,200	
B	10,900	7,127	8,842	11,408	12,667	12,893	13,050	13,023	12,827	12,458	11,891	10,270	11,109	12,395	13,486	13,481
C													10,591	11,403	12,147	12,132
D													10,078	10,410	10,817	10,771
15 to 19 years:																	
A														12,101	14,333	16,098
B	8,762	10,782	7,078	8,757	11,307	11,600	11,823	12,086	12,489	12,610	12,832	11,834	10,225	11,061	12,345	13,436
C														10,548	11,360	12,101
D														10,036	10,369	10,776
20 to 24 years:															12,014	14,234
A															10,981	12,260
B	9,590	8,623	10,688	6,967	8,634	9,554	10,221	10,702	10,848	11,213	11,501	12,725	11,737	10,147	10,472	11,282
C															9,963	10,297
D																
25 to 29 years:																11,881
A																10,859
B	5,304	9,394	8,510	10,587	6,818	6,049	5,792	6,349	7,452	8,520	9,429	11,354	12,569	11,596	10,030	10,355
C																9,852
D																
30 to 34 years	3,945	5,176	9,244	8,360	10,416	10,651	10,471	9,285	7,828	6,694	5,940	9,268	11,160	12,362	11,408	9,874
35 to 39 years	5,112	3,831	5,074	9,050	8,146	7,947	7,984	8,746	9,610	10,179	10,408	5,805	9,065	10,922	12,105	11,176
40 to 44 years	4,515	4,926	3,733	4,942	8,766	9,175	9,323	8,850	8,288	7,899	7,712	10,107	5,639	8,816	10,629	11,787
45 to 49 years	3,516	4,307	4,771	3,615	4,748	5,246	6,123	7,070	7,848	8,430	8,825	7,421	9,736	5,434	8,510	10,266
50 to 54 years	2,920	3,299	4,115	4,583	3,433	3,370	3,440	3,656	4,022	4,493	5,064	8,360	7,035	9,239	5,160	8,103
55 to 59 years	2,397	2,663	3,072	3,889	4,276	4,132	3,935	3,696	3,421	3,171	3,116	4,698	7,753	6,531	8,587	4,800
60 to 64 years	1,939	2,106	2,373	2,802	3,520	3,613	3,676	3,722	3,772	3,819	3,691	2,789	4,220	6,966	5,870	7,734
65 to 69 years	1,382	1,620	1,796	1,977	2,406	2,517	2,641	2,768	2,896	2,977	3,059	3,126	2,366	3,603	5,943	5,015
70 to 74 years	873	1,082	1,291	1,419	1,519	1,571	1,631	1,705	1,793	1,897	1,986	2,419	2,477	1,881	2,883	4,755
75 years and over	853	1,060	1,317	1,570	1,771	1,824	1,878	1,930	1,975	2,021	2,090	2,523	3,068	3,425	3,262	3,861
FEMALE																	
All ages:																	
A								133,858	135,263	136,715	138,209	146,456	155,755	164,495	173,001	182,216
B	100,165	107,852	116,410	124,687	130,280	131,343	132,492	133,645	134,812	135,998	137,199	143,522	150,240	156,376	162,071	167,637
C								133,539	134,587	135,642	136,697	142,060	147,496	152,339	156,676	160,558
D								133,433	134,363	135,286	136,195	140,595	144,742	148,288	151,282	153,571

See footnote at end of table.

TABLE II.—ESTIMATED AND PROJECTED POPULATION, BY 5-YEAR AGE GROUPS AND SEX: 1950 TO 2001—Continued

[Numbers in thousands as of Jan. 1. Figures may not add to totals due to rounding. See text for an explanation of the series]

Series and age	1950	1955	1960	1965	1970	1971	1972	1973	1974	1975	1976	1981	1986	1991	1996	2001
Under 5 years:																
A								10, 383	10, 796	11, 282	11, 813	13, 964	15, 655	15, 666	15, 594	16, 670
B								10, 170	10, 345	10, 565	10, 803	12, 033	13, 063	13, 040	12, 761	12, 988
C								10, 064	10, 120	10, 209	10, 301	11, 068	11, 772	11, 732	11, 381	11, 286
D								9, 958	9, 896	9, 853	9, 799	10, 104	10, 480	10, 423	10, 022	9, 678
	8, 829	11, 212	12, 033	11, 941	10, 083	10, 027	10, 040									
5 to 9 years:																
A												11, 746	13, 892	15, 578	15, 597	15, 528
B												10, 743	11, 967	12, 998	12, 982	12, 709
C												10, 246	11, 011	11, 715	11, 680	11, 335
D												9, 745	10, 050	10, 428	10, 377	9, 981
	7, 051	8, 621	11, 060	12, 110	12, 010	11, 465	10, 991	10, 555	10, 215	10, 017	9, 971					
10 to 14 years:																
A												11, 734	13, 878	15, 564	15, 590	
B												10, 736	11, 960	12, 992	12, 977	
C												10, 239	11, 005	11, 709	11, 677	
D												9, 738	10, 045	10, 425	10, 374	
	10, 987	7, 020	8, 592	10, 979	12, 202	12, 423	12, 575	12, 542	12, 348	11, 991	11, 448	9, 962				
15 to 19 years:																
A													11, 712	13, 856	15, 542	
B													10, 717	11, 941	12, 986	
C													10, 226	11, 001	11, 709	
D													9, 731	10, 045	10, 425	
	8, 921	10, 927	7, 002	8, 557	10, 847	11, 126	11, 356	11, 635	12, 049	12, 182	12, 403	11, 425	9, 942			
20 to 24 years:																
A														11, 687	13, 831	
B														10, 692	11, 917	
C														10, 202	10, 981	
D														9, 710	10, 035	
	10, 721	8, 852	10, 882	7, 002	8, 484	9, 340	9, 946	10, 376	10, 488	10, 823	11, 103	12, 378	11, 400	9, 917		
25 to 29 years:																
A																11, 662
B																10, 667
C																10, 177
D																9, 685
	7, 909	10, 620	8, 788	10, 845	6, 962	6, 156	5, 850	6, 364	7, 428	8, 457	9, 315	11, 075	12, 347	11, 373	9, 892	
30 to 34 years	6, 157	7, 819	10, 541	8, 651	10, 745	11, 012	10, 847	9, 629	8, 115	6, 926	6, 126	9, 273	11, 027	12, 298	11, 336	9, 865
35 to 39 years	7, 954	6, 068	7, 751	10, 437	8, 460	8, 219	8, 265	9, 096	10, 041	10, 676	10, 945	6, 090	9, 222	10, 970	12, 238	11, 282
40 to 44 years	6, 831	7, 811	5, 988	7, 667	10, 252	10, 285	10, 176	9, 503	8, 894	8, 379	8, 143	10, 848	6, 038	9, 149	10, 889	12, 154
45 to 49 years	6, 325	6, 680	7, 735	5, 852	7, 518	8, 176	8, 831	9, 547	9, 942	10, 107	10, 143	8, 037	10, 710	5, 963	9, 043	10, 769
50 to 54 years	5, 022	6, 139	6, 557	7, 802	5, 652	5, 578	5, 743	6, 114	6, 675	7, 357	8, 005	9, 933	7, 874	10, 506	5, 850	8, 886
55 to 59 years	3, 908	4, 813	5, 961	6, 481	7, 746	7, 504	7, 086	6, 549	5, 916	5, 478	5, 410	7, 772	9, 649	7, 657	10, 224	5, 695
60 to 64 years	3, 297	3, 671	4, 553	5, 789	6, 260	6, 449	6, 693	6, 969	7, 225	7, 388	7, 157	5, 170	7, 441	9, 240	7, 341	9, 822
65 to 69 years	2, 500	2, 994	3, 375	4, 100	5, 422	5, 498	5, 543	5, 590	5, 690	5, 784	5, 964	6, 625	4, 799	6, 928	8, 609	6, 851
70 to 74 years	1, 759	2, 149	2, 597	2, 912	3, 486	3, 778	4, 072	4, 339	4, 565	4, 765	4, 837	5, 269	5, 858	4, 261	6, 183	7, 689
75 years and over	1, 994	2, 456	2, 995	3, 562	4, 151	4, 307	4, 478	4, 667	4, 876	5, 103	5, 426	6, 889	8, 167	9, 399	9, 098	10, 380

[1] See note 3 to App. table I.

Source: Baldwin, "Estimates," 1973, and detailed data from the files of the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce.

[Numbers in thousands as of Jan. 1. See text for an explanation of the series]

Population group, sex, and series	1950	1955	1960	1965	1970	1971	1972	1973	1974	1975	1976	1981	1986	1991	1996	2001
All ages:																
A	178,547	194,415	212,372	229,628	[1] 241,635	[1] 243,896	[1] 246,300	249,161	252,117	255,175	258,332	275,866	295,685	314,430	332,400	351,598
B								248,726	251,197	253,715	256,274	269,878	284,433	297,865	310,096	321,862
C								248,509	250,737	252,985	255,246	266,894	278,827	289,618	299,079	307,401
D								248,292	250,278	252,256	254,219	263,910	273,222	281,366	288,075	293,151
Kindergarten ages (3 to 6):																
A	9,679	17,238	18,672	20,514	17,528	16,824	16,405	16,221	16,136	16,310	17,014	21,019	24,370	25,767	25,220	26,061
B											16,584	18,510	20,556	21,468	20,917	20,865
C											16,370	17,262	18,655	19,323	18,780	18,390
D											16,156	16,014	16,752	17,177	16,647	16,015
School ages (7 to 18):																
A	45,791	41,564	40,822	51,744	58,125	58,447	58,464	58,355	57,620	56,784	55,943	52,129	56,383	66,793	73,822	76,171
B												51,218	52,186	57,740	62,114	63,292
C												50,765	50,101	53,240	56,294	56,888
D												50,314	48,015	48,734	50,450	50,486
Males of military ages (18 to 34):																
A	22,855	26,906	32,336	28,730	30,256	30,727	30,901	30,988	31,059	31,326	31,826	38,430	39,589	38,596	38,914	42,304
B														38,378	37,186	38,278
C														38,270	36,334	36,279
D														38,164	35,481	34,277
Able-bodied ages:																
A	102,656	113,441	119,467	123,366	130,586	132,888	135,296	137,750	140,307	142,981	145,737	156,465	159,409	163,888	171,578	185,778
B														162,448	166,563	175,724
C														161,737	164,092	170,741
D														161,025	161,601	165,741
Males (16 to 59):																
A	44,447	50,761	55,244	58,620	64,054	65,362	66,652	67,920	69,219	70,596	72,142	79,452	82,851	84,529	89,728	94,943
B														83,794	87,173	89,832
C														83,430	85,911	87,288
D														83,068	84,644	84,747
Females (16 to 54):																
A	58,209	62,680	64,223	64,746	66,532	67,526	68,644	69,830	71,088	72,385	73,595	77,013	76,558	79,359	81,850	90,835
B														78,654	79,390	85,892
C														78,307	78,181	83,453
D														77,957	76,957	80,994
Older ages	18,505	21,951	26,258	30,612	36,281	37,061	37,698	38,239	38,753	39,232	39,620	42,582	48,045	53,360	59,413	61,802
Males (60 and over)	5,047	5,868	6,777	7,768	9,216	9,525	9,826	10,125	10,436	10,714	10,826	10,857	12,131	15,875	17,958	21,365
Females (55 and over)	13,458	16,083	19,481	22,844	27,065	27,536	27,872	28,114	28,317	28,518	28,794	31,725	35,914	37,485	41,455	40,435

See note 3 to app. table I.

Source: Baldwin, "Estimates", 1973, and detailed data from the files of the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE IV.—POPULATION BY ADMINISTRATIVE AREA: 1959, 1970, AND 1972

[Population figures in thousands]

Area	1959 total (Jan. 15)	Jan. 15, 1970			1972 total (Jan. 1)	Percent change, 1959–70	Population density, 1970 (persons per km²)
		Total	Urban	Rural			
U.S.S.R.	208,827	241,720	135,991	105,729	246,309	15.8	10.9
R.S.F.S.R.	117,534	130,079	80,981	49,098	131,437	10.7	7.6
Altay Kray	2,683	2,670	1,228	1,442	2,638	−.5	10.2
Gorno-Altay Autonomous Oblast	157	168	40	128	166	7.0	1.8
Other	2,526	2,502	1,188	1,314	2,472	−1.0	14.8
Khabarovsk Kray	1,142	1,346	1,047	299	1,396	17.9	1.6
Jewish Autonomous Oblast	163	172	118	54	178	5.5	4.8
Other	979	1,174	929	245	1,218	19.9	1.5
Krasnodar Kray	3,762	4,510	2,121	2,389	4,609	19.9	54.0
Adyge Autonomous Oblast	285	385	152	233	397	35.1	50.8
Other	3,477	4,125	1,969	2,156	4,212	18.6	54.3
Krasnoyarsk Kray	2,615	2,962	1,831	1,131	2,992	13.3	1.2
Khakass Autonomous Oblast	411	446	266	180	455	8.5	7.2
Taymyr (Dolgano-Nenets) National Okrug	33	38	23	15	41	15.2	(1)
Evenki National Okrug	10	13	4	9	13	30.0	(1)
Other	2,161	2,465	1,538	927	2,483	14.1	3.5
Primorsk Kray	1,381	1,721	1,254	467	1,800	24.6	16.4
Stavropol Kray	1,883	2,306	980	1,326	2,356	22.5	28.6
Karachay-Cherkess Autonomous Oblast	278	345	113	232	352	24.1	24.5
Other	1,605	1,961	867	1,094	2,004	22.2	29.5
Amur Oblast	718	793	490	303	825	10.4	2.2
Arkhangel Oblast	1,276	1,401	921	480	1,406	9.8	2.4
Nenets National Okrug	46	39	21	18	39	−15.2	.2
Other	1,230	1,362	900	462	1,367	10.7	3.3
Astrakhan Oblast	702	868	526	342	883	23.6	19.7
Belgorod Oblast	1,226	1,261	444	817	1,260	2.9	46.5
Bryansk Oblast	1,550	1,582	750	832	1,563	2.1	45.3
Chelyabinsk Oblast	2,977	3,289	2,563	726	3,306	10.5	37.4
Chita Oblast	1,036	1,145	658	487	1,169	10.5	2.7
Aginsk-Buryat National Okrug	49	66	14	52	67	34.7	3.5
Other	987	1,079	644	435	1,102	9.3	2.6
Gorkiy Oblast	3,591	3,683	2,378	1,305	3,667	2.6	49.2
Ivanovo Oblast	1,322	1,339	1,010	329	1,328	1.3	56.0
Irkutsk Oblast	1,976	2,313	1,673	640	2,350	17.1	3.0
Ust-Orda Buryat National Okrug	133	146	25	121	142	9.8	6.7
Other	1,843	2,167	1,648	519	2,208	17.6	2.9
Kaliningrad Oblast	611	732	536	196	750	19.8	48.5
Kalinin Oblast	1,807	1,717	976	741	1,705	−5.0	20.4
Kaluga Oblast	936	995	516	479	988	6.3	33.3
Kamchatka Oblast	221	288	219	69	311	30.3	.6
Koryak National Okrug	28	31	10	21	32	10.7	.1
Other	193	257	209	48	279	33.2	1.5
Kemerovo Oblast	2,786	2,918	2,401	517	2,900	4.7	30.6
Kirov Oblast	1,916	1,727	944	783	1,688	−9.9	14.3
Kostroma Oblast	920	871	465	406	835	−5.3	14.5
Kuybyshev Oblast	2,258	2,751	1,970	781	2,874	21.8	51.3
Kurgan Oblast	999	1,085	464	621	1,076	8.6	15.3
Kursk Oblast	1,483	1,474	486	988	1,448	−.6	49.4
Leningrad Oblast	4,566	5,386	4,821	565	5,539	18.0	62.7
Lipetsk Oblast	1,141	1,224	542	682	1,225	7.3	50.8
Magadan Oblast	236	353	264	89	381	49.6	.3
Chukot National Okrug	47	101	70	31	112	114.9	.1
Other	189	252	194	58	269	33.3	.5

See footnotes at end of table.

TABLE IV.—POPULATION BY ADMINISTRATIVE AREA: 1959, 1970, AND 1972—Continued

[Population figures in thousands]

Area	1959 total (Jan. 15)	Jan. 15, 1970			1972 total (Jan. 1)	Percent change, 1959–70	Population density, 1970 (persons per km²)
		Total	Urban	Rural			
Moscow Oblast	10,949	12,836	11,034	1,802	13,186	17.2	273.1
Murmansk Oblast	568	799	708	91	835	40.7	5.5
Novgorod Oblast	736	722	386	336	718	−1.9	13.1
Novosibirsk Oblast	2,299	2,505	1,638	867	2,511	9.0	14.1
Omsk Oblast	1,645	1,824	1,008	816	1,829	10.9	13.1
Orel Oblast	929	931	362	569	912	.2	37.7
Orenburg Oblast	1,829	2,050	1,088	962	2,056	12.1	16.5
Penza Oblast	1,510	1,536	679	857	1,525	1.7	35.6
Perm Oblast	2,993	3,023	2,031	992	2,982	1.0	18.8
Komi-Permyak National Okrug	217	212	40	172	200	−2.3	6.5
Other	2,776	2,811	1,991	820	2,782	1.3	22.0
Pskov Oblast	952	875	373	502	867	−8.1	15.8
Rostov Oblast	3,312	3,831	2,420	1,411	3,915	15.7	38.0
Ryazan Oblast	1,445	1,412	665	747	1,396	−2.3	35.7
Sakhalin Oblast	649	615	483	132	633	−5.2	7.1
Saratov Oblast	2,163	2,454	1,598	856	2,478	13.5	24.5
Smolensk Oblast	1,143	1,106	529	577	1,094	−3.2	22.2
Sverdlovsk Oblast	4,044	4,320	3,485	835	4,319	6.8	22.2
Tambov Oblast	1,549	1,512	591	921	1,475	−2.4	44.0
Tomsk Oblast	747	786	466	320	804	5.2	2.5
Tula Oblast	1,920	1,952	1,392	560	1,942	1.7	76.0
Tyumen Oblast	1,092	1,406	690	716	1,458	28.8	1.0
Khanty-Mansi National Okrug	124	271	170	101	306	118.5	.5
Yamalo-Nenets National Okrug	62	80	34	46	98	29.0	.1
Other	905	1,055	486	569	1,054	16.4	6.5
Ulyanovsk Oblast	1,117	1,225	641	584	1,233	9.7	32.8
Vladimir Oblast	1,402	1,511	1,023	488	1,524	7.8	52.1
Volgograd Oblast	1,854	2,323	1,523	800	2,371	25.3	20.4
Vologda Oblast	1,308	1,293	616	680	1,286	−.9	8.9
Voronezh Oblast	2,369	2,527	1,151	1,376	2,517	6.7	48.2
Yaroslavl Oblast	1,395	1,400	981	419	1,398	.3	38.5
Bashkir A.S.S.R.	3,342	3,818	1,839	1,979	3,835	14.2	26.6
Buryat A.S.S.R.	673	812	363	449	826	20.7	2.3
Chechen Ingush A.S.S.R.	710	1,065	444	621	1,101	50.0	55.2
Chuvash A.S.S.R.	1,098	1,224	437	787	1,243	11.5	65.9
Dagestan A.S.S.R.	1,033	1,429	505	924	1,476	34.4	28.4
Kabardin-Balkar A.S.S.R.	420	588	280	308	614	40.0	47.1
Kalmyk A.S.S.R.	185	268	92	176	271	44.9	3.5
Kare'ian A.S.S.R.	651	713	490	223	715	9.5	4.1
Komi A.S.S.R.	806	965	598	367	984	19.7	2.3
Mari A.S.S.R.	643	685	280	405	698	5.7	29.5
Mordovian A.S.S.R.	1,000	1,029	373	656	1,020	2.9	39.3
North Ossetian A.S.S.R.	451	552	355	196	570	22.4	69.1
Tatar A.S.S.R.	2,850	3,131	1,614	1,517	3,202	9.9	46.1
Tuvin A.S.S.R.	172	231	87	144	242	34.3	1.4
Udmurt A.S.S.R.	1,337	1,418	809	609	1,424	6.1	33.7
Yakut A.S.S.R.	488	664	375	289	694	36.1	.2
Ukrainian S.S.R.	41,869	47,126	25,688	21,438	47,878	12.6	78.1
Cherkassy Oblast	1,503	1,535	563	972	1,545	2.1	73.5
Chernigov Oblast	1,554	1,560	540	1,020	1,533	.4	48.9
Chernovtsy Oblast	774	845	292	553	862	9.2	104.3
Crimean Oblast	1,201	1,813	1,146	667	1,909	51.0	67.2
Dnepropetrovsk Oblast	2,705	3,343	2,549	794	3,431	23.6	104.8
Donets Oblast	4,262	4,892	4,276	616	4,980	14.8	184.7
Ivan-Franko Oblast	1,095	1,249	384	865	1,273	14.1	89.9
Kharkov Oblast	2,520	2,826	1,958	868	2,883	12.1	90.0
Kherson Oblast	824	1,030	555	475	1,063	25.1	36.4
Khmelnitskiy Oblast	1,611	1,615	431	1,184	1,603	.2	78.4
Kiev Oblast	2,823	3,466	2,287	1,179	3,612	22.8	119.6
Kirovograd Oblast	1,218	1,259	552	707	1,265	3.4	51.2
Lvov Oblast	2,108	2,429	1,149	1,280	2,472	15.2	111.4
Nikolayev Oblast	1,014	1,148	605	543	1,168	13.2	46.5
Odessa Oblast	2,027	2,389	1,335	1,054	2,445	17.9	71.8
Poltava Oblast	1,632	1,706	679	1,027	1,720	4.5	59.3
Rovno Oblast	926	1,048	288	760	1,067	13.2	52.1
Sumy Oblast	1,514	1,505	655	850	1,481	−.6	63.2
Ternopol Oblast	1,086	1,153	269	884	1,167	6.2	83.6
Vinnitsa Oblast	2,142	2,132	542	1,590	2,116	−.5	80.5
Volyn Oblast	890	974	313	661	989	9.4	48.3
Voroshilovgrad Oblast	2,452	2,751	2,271	480	2,777	12.2	162.9
Zakarpatsk Oblast	920	1,057	314	743	1,087	14.9	82.6
Zaporozhye Oblast	1,464	1,775	1,167	608	1,832	21.2	65.3
Zhitomir Oblast	1,604	1,626	568	1,058	1,598	1.4	54.4

TABLE IV.—POPULATION BY ADMINISTRATIVE AREA: 1959, 1970, AND 1972—Continued

[Populations figures in thousands]

Area	1959 total (Jan. 15)	Jan. 15, 1970			1972 total (Jan. 1)	Percent change, 1959–70	Population density, 1970 (persons per km²)
		Total	Urban	Rural			
Belorussian S.S.R.	8,055	9,002	3,908	5,094	9,142	11.8	43.4
Brest Oblast	1,191	1,295	451	844	1,311	8.7	40.1
Gomel Oblast	1,362	1,533	616	917	1,556	12.6	38.0
Grodno Oblast	1,078	1,120	369	751	1,125	3.9	44.8
Minsk Oblast	1,982	2,457	1,327	1,130	2,528	24.0	60.2
Mogilev Oblast	1,166	1,227	522	705	1,236	5.2	42.3
Vitebsk Oblast	1,276	1,370	623	747	1,386	7.4	34.2
Uzbek S.S.R.[2]	8,261	11,960	4,362	7,598	12,526	44.8	26.6
Andizhan Oblast	767	1,059	255	804	1,124	38.1	246.5
Bukhara Oblast	574	934	292	642	998	62.7	6.5
Fergana Oblast	939	1,332	440	892	1,419	41.9	187.4
Kashkadarya Oblast	508	801	132	669	857	57.7	28.2
Khorezm Oblast	381	554	103	451	587	45.4	123.2
Namangan Oblast	595	847	242	605	906	42.4	108.6
Samarkand Oblast	1,031	1,469	393	1,076	1,556	42.5	50.3
Surkhan-Darya Oblast	422	662	106	556	707	56.9	31.8
Syrdarya Oblast[2]	527	736	173	563	616	39.7	31.9
Tashkent Oblast	2,007	2,864	1,977	887	3,012	42.7	183.6
Kara-Kalpak A.S.S.R.	510	702	249	453	744	37.6	4.2
Kazakh S.S.R.[2]	9,154	12,849	6,498	6,351	13,470	40.4	4.7
Aktyubinsk Oblast	401	551	248	303	573	37.4	1.8
Alma-Ata Oblast	1,406	1,442	861	581	1,526	2.6	13.8
Chimkent Oblast[3]	766	1,128	461	667	1,345	47.3	9.4
Dzhambul Oblast	557	794	320	474	821	42.5	5.5
East Kazakhstan Oblast	735	845	485	360	857	15.0	8.7
Guryev Oblast	288	500	330	170	539	73.6	1.8
Karaganda Oblast	1,025	1,552	1,259	293	1,610	51.4	3.9
Kokchetav Oblast	491	589	178	411	596	20.0	7.5
Kustanay Oblast[3]	700	985	383	602	911	40.7	5.0
Kzyl-Orda Oblast[3]	327	492	269	223	516	50.5	2.2
North Kazakhstan Oblast	469	556	212	344	554	18.6	12.6
Pavlodar Oblast	455	698	340	358	724	53.4	5.5
Semipalatinsk Oblast	516	714	317	397	724	38.4	4.0
Taldy-Kurgan Oblast	(4)	610	237	373	633	(4)	5.2
Tselinograd Oblast[3]	637	881	441	440	776	38.3	5.7
Uralsk Oblast	381	513	158	355	531	34.6	3.4
Georgian S.S.R.	4,044	4,686	2,240	2,446	4,789	15.9	67.3
Abkhaz A.S.S.R.	405	487	215	272	492	20.2	56.6
Adzhar A.S.S.R.	245	310	137	173	322	26.5	103.3
South Ossetian Autonomous Oblast	97	99	36	63	102	2.1	25.5
Other	3,297	3,790	1,852	1,938	3,873	15.0	69.9
Azerbaydzhan S.S.R.	3,698	5,117	2,564	2,553	5,326	38.4	59.0
Nakhichevan A.S.S.R.	141	202	50	152	211	43.3	36.7
Nagorno-Karabakh Autonomous Oblast	131	150	57	93	153	14.5	33.9
Other	3,426	4,765	2,457	2,308	4,962	37.1	62.1
Lithuanian S.S.R.	2,711	3,128	1,571	1,557	3,202	15.4	48.0
Moldavian S.S.R.	2,885	3,569	1,130	2,439	3,670	23.7	106.0
Latvian S.S.R.	2,093	2,364	1,477	887	2,409	12.9	37.1
Kirgiz S.S.R.	2,066	2,933	1,098	1,835	3,074	42.0	14.8
Osh Oblast	870	1,233	381	852	1,307	41.7	16.7
Other	1,196	1,700	717	983	1,767	42.1	13.6
Tadzhik S.S.R.	1,981	2,900	1,077	1,823	3,096	46.4	20.3
Gorno-Badakhshan Autonomous Oblast	73	98	12	86	105	34.2	1.5
Other	1,908	2,802	1,065	1,737	2,991	46.9	35.3
Armenian S.S.R.	1,763	2,492	1,482	1,010	2,606	41.3	83.7
Turkmen S.S.R.	1,516	2,159	1,034	1,125	2,293	42.4	4.4
Estonian S.S.R.	1,197	1,356	881	475	1,391	13.3	30.1

[1] Less than 0.05 persons per km².

[2] Figures shown for 1959 and 1970 do not reflect the transfer of territory (2,200 km²) from the Uzbek to the Kazakh Republic between July 1, 1971, and Jan. 1, 1972. This territory was taken from Syrdarya Oblast in the Uzbek S.S.R. but it is not known which oblast(s) in the Kazakh S.S.R. gained the territory.

[3] Figures shown for 1959 and 1970 indicate the status as of the census date in 1970 and do not reflect the transfer of territory from the Chimkent, Kustanay, Kzyl-Orda, and Tselinograd Oblasts to form a new oblast—Turgay. This transfer occurred after the census and prior to July 1, 1971. The newly formed Turgay Oblast had a population of 222,000 as of the 1970 census and 234,000 on Jan. 1, 1972.

[4] Included with Alma Ata Oblast.

Source: "Population:" 1959: Figures for administrative units which had no change in area between the 2 census dates were taken from TsSU, "Itogi," 1962, pp. 20–29. Figures for those units which had changes in boundaries and area between the censuses were taken from various issues of "Nar. khoz." for the U.S.S.R. and the separate republics. 1970: Presidium, SSSR, "Administrativno," 1971, pp. 5–497. 1972: "Nar. khoz, 1922–72," pp. 13–18.

TABLE V.—ETHNIC COMPOSITION OF THE POPULATION: 1959 AND 1970

[Absolute numbers in thousands as of Jan. 15]

Ethnic group	1959	1970	Percent of total 1959	Percent of total 1970	Percent change, 1959–70	Percent who consider the language of the ethnic group as their native language 1959	Percent who consider the language of the ethnic group as their native language 1970
Total	208,827	241,720	100.00	100.00	15.8	94.3	93.9
Russian	114,114	129,015	54.65	53.37	13.1	99.8	99.8
Ukrainian	37,253	40,753	17.84	16.86	9.4	87.7	85.7
Uzbek	6,015	9,195	2.88	3.80	52.9	98.4	98.6
Belorussian	7,913	9,052	3.79	3.74	14.4	84.2	80.6
Tatar	4,968	5,931	2.38	2.45	19.4	92.1	89.2
Kazakh	3,622	5,299	1.73	2.19	46.3	98.4	98.0
Azerbaydzhanian	2,940	4,380	1.41	1.81	49.0	97.6	98.2
Armenian	2,787	3,559	1.33	1.47	27.7	89.9	91.4
Georgian	2,692	3,245	1.29	1.34	20.5	98.6	98.4
Moldavian	2,214	2,698	1.06	1.12	21.9	95.2	95.0
Lithuanian	2,326	2,665	1.11	1.10	14.6	97.8	97.9
Jewish	2,268	2,151	1.09	.89	−5.2	21.5	17.7
Tadzhik	1,397	2,136	.67	.88	52.9	98.1	98.5
German	1,620	1,846	.78	.76	14.0	75.0	66.8
Chuvash	1,470	1,694	.70	.70	15.2	90.8	86.9
Turkmenian	1,002	1,525	.48	.63	52.2	98.9	98.9
Kirgiz	969	1,452	.46	.60	49.8	98.7	98.8
Latvian	1,400	1,430	.67	.59	2.1	95.1	95.2
Peoples of Dagestan	945	1,365	.45	.56	44.4	96.2	96.5
Including:							
Avar	270	396	.13	.16	46.7	97.2	97.2
Lesghian	223	324	.11	.13	45.3	92.7	93.9
Durghin	158	231	.08	.10	46.2	98.6	98.4
Kumyk	135	189	.06	.08	40.0	98.0	98.4
Lak	34	86	.03	.04	152.9	95.8	95.6
Tabasaran	35	55	.02	.02	57.1	99.2	98.9
Nogay	39	52	.02	.02	−24.6	90.0	89.8
Rutal	6.7	12	.0032	.005	79.1	99.9	98.9
Tsakhur	7.3	11	.0035	.005	50.7	99.2	96.5
Agul	6.7	8.8	.0032	.004	31.3	99.4	99.4
Mordvinian	1,285	1,263	.62	.52	−1.7	78.1	77.8
Bashkir	989	1,240	.47	.51	25.4	61.9	66.2
Polish	1,380	1,167	.66	.48	−15.4	45.2	32.5
Estonian	989	1,007	.47	.42	1.8	95.2	95.5
Udmurt	625	704	.30	.29	12.6	89.1	82.6
Chechen	419	613	.20	.25	46.3	98.8	98.7
Mari	504	599	.24	.25	18.8	95.1	91.2
Ossetian	413	488	.20	.20	18.2	89.1	88.6
Komi and Komi-Permyak	431	475	.21	.20	10.2	88.7	83.7
Komi	287	322	.14	.13	12.2	89.3	82.7
Komi-Permyak	144	153	.07	.06	6.3	87.6	85.8
Korean	314	357	.15	.15	13.7	79.3	68.6
Bulgarian	324	351	.16	.15	8.3	79.4	73.1
Greek	309	337	.15	.14	9.1	41.5	39.3
Buryat	253	315	.12	.13	24.5	94.9	92.6
Yakut	233	296	.11	.12	27.0	97.6	96.3
Kabardian	204	280	.10	.12	37.3	97.9	98.0
Kara-Kalpak	173	236	.08	.10	36.4	95.0	96.6
Gypsy	132	175	.06	.07	32.6	59.3	70.8
Uigur	95	173	.05	.07	82.1	85.0	88.5
Hungarian	155	166	.07	.07	7.1	97.2	96.6
Ingush	106	158	.05	.07	49.1	97.9	97.4
Gagauz	124	157	.06	.06	26.6	94.0	93.6
Peoples of the North, Siberia, and the Far East	130	151	.06	.06	16.2	75.9	67.4
Including:							
Nenets	23	29	.01	.01	26.1	84.7	83.4
Evenki	25	25	.01	.01	0	55.9	51.3
Khant	19	21	.01	.01	10.5	77.0	68.9
Chukchi	12	14	.01	.01	16.7	93.9	82.6
Even	9.1	12	.004	.005	31.9	81.4	56.0
Nanai	8.0	10	.004	.004	25.0	86.3	69.1
Mansi	6.45	7.7	.003	.003	19.4	59.2	52.4
Koryak	6.3	7.5	.003	.003	19.0	90.5	81.1
Dolgan	3.9	4.9	.002	.002	25.6	93.9	89.8
Nivkhi	3.7	4.4	.002	.002	18.9	76.3	49.5
Selkup	3.8	4.3	.002	.002	13.2	50.6	51.1
Ulchi	2.1	2.4	.001	.001	14.3	84.9	60.8
Saam	1.8	1.9	.001	.001	5.6	69.9	56.2
Udege	1.4	1.5	.001	.001	7.1	73.7	55.1
Itelmen	1.1	1.3	.001	.001	18.2	36.0	35.7
Ket	1.0	1.2	.0005	.0005	20.0	77.1	74.9
Orochi	.8	1.1	.0004	.0005	37.5	68.4	48.6
Nganasan	.75	1.0	.0004	.0004	33.3	93.4	75.4
Yukagir	.4	.6	.0002	.0002	50.0	52.5	46.8

TABLE V.—ETHNIC COMPOSITION OF THE POPULATION: 1959 AND 1970—Continued

[Absolute numbers in thousands as of Jan. 15]

Ethnic group	1959	1970	Percent of total		Percent change, 1959–70	Percent who consider the language of the ethnic group as their native language	
			1959	1970		1959	1970
Karelian	167	146	.08	.06	−12.6	71.3	63.0
Tuvinian	100	139	.05	.06	39.0	99.1	98.7
Kalmyk	106	137	.05	.06	29.2	91.0	91.7
Romanian	106	119	.05	.05	12.3	83.3	63.9
Karachai	81	113	.04	.05	39.5	96.8	98.1
Adighe	80	100	.04	.04	25.0	96.8	96.5
Kurd	59	89	.03	.04	50.8	89.9	87.6
Finnish	93	85	.04	.04	−8.6	59.5	51.0
Abkhaz	65	83	.03	.03	27.7	95.0	95.9
Turkish	35	79	.02	.03	125.7	82.2	92.3
Khakass	57	67	.03	.03	17.5	86.0	83.7
Balkar	42	60	.02	.02	42.9	97.0	97.2
Altay	45	56	.02	.02	24.4	88.5	87.2
Cherkess	30	40	.01	.02	33.3	89.7	92.0
Dungan	22	39	.01	.02	77.3	95.1	94.3
Iranian (Persian)	21	28	.01	.01	33.3	44.7	36.9
Abazin	20	25	.01	.01	25.0	94.8	96.1
Assyrian	22	24	.01	.01	9.1	64.3	64.5
Czech	25	21	.01	.01	−16.0	49.0	42.9
Tat	11	17	.01	.01	54.5	70.9	72.6
Shor	15	16	.01	.01	6.7	83.7	73.5
Slovak	15	12	.01	.005	−20.0	61.2	52.0
Other	108	126	.05	.05	16.7	61.6	69.4

Source: "Izvestiya," Apr. 17, 1971.

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LABOR CONSTRAINTS IN THE FIVE-YEAR PLAN

By MURRAY FESHBACH *and* STEPHEN RAPAWY

CONTENTS

I. INTRODUCTION

Considerable attention in Soviet literature has been devoted to the existence or nonexistence of a labor shortage throughout the economy. Many publications have contained warnings that the shortage will continue throughout the 1970's and have serious effects on the growth of the economy, and there is ample evidence to support this thesis. Perhaps the most direct evidence of the constraints in labor supply under which the Soviet economy currently operates are the Ninth Five-Year Plan projections of growth in industry. In contrast to the previous pattern of a 3 to 4 percent annual average rate of growth of industrial employment, the current plan calls for only about 1.3 percent per year,[1] with output increasing almost entirely as the result of increased labor productivity. Also the change in labor supply

[1] Gosplan, *Gosudarstvennyy*, 1972, p. 89.

actually recorded compared with demand as expressed by the plan shows the tightening of the market. Thus, for most years prior to the 1960's the planned number of workers and employees was met, and in industry the actual number frequently was 200,000–300,000 persons above the plan. By 1965, however, this pattern altered with the result that the actual number employed in industry was barely 25,000 above the plan, and by 1967 there was a shortage of 125,000 industrial-production personnel relative to plan requirements.[2] The 1970 goal of 91–92 million workers and employees was not met; instead there was a shortfall of about 1.7 million, and for 1971, a shortfall of 1.3 million is indicated.[3]

While the demand of enterprises for manpower has been found to be excessive, making the "real" balance of demand and supply about equal, individual branches of the economy and industry are distinctly short of manpower as are certain regions and occupations. The shortages occur primarily in the construction, transport, light, and food industry branches, and especially in the services branches, where the work is considered by many to be degrading and of low occupational prestige.[4] Shortages of machine-tool operators and other skilled wage-workers continue in all branches of industry, as do shortages of specialists with higher and specialized secondary education. According to Soviet estimates based on unpublished materials of TsSU (*Tsentral'noye statisticheskoye upravleniye*—Central Statistical Administration of the U.S.S.R.), in 1963 there was a shortage of 865,000 engineers and technicians to fill all the managerial and engineering-technical positions in the nation's industrial enterprises. By the end of 1968, the shortage was cut in half (to 426,000), but it still amounted to 12 percent of the 3,520,000 such positions.[5]

Shortages in certain regions reflect not only their regions' appropriate shares of the aggregate shortfalls cited above, but also deficits in terms of the lack of skilled personnel among the indigenous populations, and especially the problems caused by migration and labor turnover. Annual unplanned labor turnover in the country as a whole continues at a rate of about 20 percent of the wageworkers in industry and at about a third of workers in construction. Even with organized recruitment from labor surplus areas in the west, many individual enterprises in the eastern regions reportedly cannot go into full production because of a shortage of workers. And, even in such previously surplus areas as the Ukraine, the same situation now prevails.[6] When Premier Kosygin addressed the State Planning Committee in September 1972 he included a significant reference to the extensive delay in reaching planned capacity which in turn resulted in underproduction of needed output.[7] Much of this delay must have been due to shortages of labor at individual plants. Large cities such as Moscow and Leningrad continue to experience labor shortages, due not only to high levels of demand but also to crowded housing conditions which

[2] From a speech by B. N. Bezrukov, Chief, Labor Resources Department, Gosplan U.S.S.R., cited in Zelenskiy and Voronin, "Better," 1968, p. 91.
[3] Zelenskiy and Voronin, "The Country's," 1972, p. 2.
[4] Rosyakov and Makarov, "The Labor," 1969, p. 7, and Krevnevich, "The Services," 1970, p. 2.
[5] Zargarov, *Vosproizvodstvo*, 1969, pp. 189–190, and Komarov, *Ekonomicheskiye*, 1972, pp. 171–172. The figures which at first indicate a marked improvement, however, are incomplete. In reality, many specialists do not work in these positions, and about 30 percent of the engineering-technical personnel are actually *praktiki*.
[6] See Yurchenko, "Means," 1971, pp. 46–47.
[7] A. N. Kosygin in "Reserves," 1972, pp. 4–5.

force the city governments to restrict in-migration of additional workers, to inadequate transportation from surrounding regions, and to the aging of the resident city populations. Small and medium-size cities may experience shortages particularly when their economic activities are dominated by industries which require (or prohibit) the employment of one sex. Changes in investment patterns are supposed to initiate changes in demand for employment of females, for example, in single-industry cities where the bulk of the jobs are hot, heavy, and hazardous and not open to female labor.

Reflecting the constraints on the growth of employment is the changing structure of sources of labor supply. Previously, much new supply came from the households, and in the case of the nonagricultural sectors, particularly from the collective farms. These sources, as well as that of pensioners have largely dried up, and new increments must come from the changes in the size of the able-bodied population who have terminated their education on a full-time basis. While, as we shall see, the basic supply situation in numerical terms appears to have markedly improved, the further lengthening of the number of years of schooling as well as regional factors place constraints even on this apparently improved source. A disproportionate share of the growth in the able-bodied population in the current and next 5-year plan periods takes place in the Central Asian republics (including Kazakhstan) where the indigenous population is less mobile, and therefore less transferable to areas of need. The results of the analysis of the regional factor in population growth indicate that not only is the picture of labor supply less promising than as first appears, but is much worse in the next decade. It is essential for the Soviet economy to meet the planned increments in capital and labor productivity planned for this 5-year plan period and the next. If the goals are to be met, a variety of probably unpopular political, social, and economic policies may be required to "rectify" the potentially difficult manpower situation.

Despite the multiplicity of references to a short supply or tautness in the supply of manpower, there is a sizable body of evidence that the shortage is more apparent than real, depending on the solution of a number of persistent and costly problems. One frequently noted practice which contributes to this situation is poor planning and the use of outdated norms in planning. Thus, in regard to the excess demand of numbers of workers and employees relative to supply in 1970 and 1971 noted above, a detailed examination by Gosplan of enterprise plans revealed that labor productivity plans were arbitrarily lowered thereby creating an excess demand for labor in order to meet output goals. And when compared with the implied number of workers and employees used for wage calculations, this examination revealed that the 1970 plan was exaggerated by 1.9 million persons and the 1971 plan by 1.3 million.[8] Thus, comparing the adjusted real demand to the actual situation in these years, rather than a shortfall there was an excess supply of 200,000 in 1970 and an equilibrium between demand and supply in 1971. (As will be argued below, however, there are good and cogent reasons for managers to attempt to acquire and hold excess

[8] Zelenskiy and Voronin, "The Country's," 1972, p. 2. However it should be noted that the Directives of the XXIIIrd Party Congress called for 91–92 million persons in 1970, or a shortfall of 0.8–1.8 million. See Kostin and Kostin, *Vsemerno*, 1971, p. 12. The question also arises, given earlier signs of such manipulations and labor "shortages," why Gosplan waited until now to make such an examination.

labor given the supply situation, demands for plant personnel for outside activities, and high turnover rates.) Outdated norms which create requirements for more labor relative to current technical and organizational requirements find expression in the heavy demand for engineers relative to technicians, and more production workers than needed to match current technology. In machine-building and metalworking, for example, only 53.5 percent of the norms in force in October 1970 were "technically based"; the others were "empirical-statistical" norms based on past practice and equipment.[9]

Regardless of which norms are appropriate, it is noteworthy that labor savings do not appear to result from the purchase of turn-key plants which supposedly would use the latest equipment and have correspondingly low manpower requirements. Thus, for example, six chemical plants designed by foreign organizations were originally projected to require 91 auxiliary wageworkers. Soviet planners apparently assessed the needs differently for they determined that the plants needed almost five times as many auxiliary workers, or a total of 430. The actual employment of such workers in these plants has turned out to be 732 persons, or eight times as many as the original design called for.[10] Whether or not this is a true reflection of the reality of the Soviet materials supply system in its anticpation of the real need for auxiliary services, it is obvious that it is a severe drain upon the labor supply.

Auxiliary workers employed in industry comprise the largest "reserve" of manpower in the Soviet economy. The economist Manevich estimates that there are 85 auxiliary workers for every 100 basic workers in Soviet industry, or about 8 million auxiliary workers In contrast, according to his estimates, there are less than half this rate of auxiliary workers in the United States, or 38 auxiliary per 100 basic workers (amounting to about 4 million auxiliary workers).[11] The detriment to the economy in the large proportion of auxiliary workers is underscored in the calculations of the Scientific Research Institute of Economics of Gosplan U.S.S.R. which show that the level of labor productivity of basic workers is 70 to 75 percent of the level achieved by their U.S. counterparts, but for auxiliary workers the ratio is only 20 to 25 percent.[12] Also, the proportion of manual workers (the bulk of whom are auxiliary workers) in industry has long been high and has dropped only insignificantly in recent years. More than one-half of all industrial workers in 1969 worked without machinery.[13] Some three-quarters of the 8 million persons working in transportation, freight-handling, and warehousing work in industry still perform their work manually. Their productivity is reported to be some 10 to 15 times lower than those performing their tasks with machinery.[14] In socialized agriculture, the share of manual work is re-

[9] Rogovskiy, "Accelerated," 1972, p. 87.

[10] Manevich, "Problems," 1969, pp. 33–34. Auxiliary workers perform service, repair, and related work in both auxiliary and basic shops. Many of them are engaged in producing tools and instruments needed in the basic shops. It is reported that 75 percent of production of these items is carried out by individual enterprises rather than by specialized plants as a basic activity. Maykov, "Labor," 1972, p. 2.

[11] Manevich, "Problems," 1969, p. 37.

[12] Moskalenko, "An Acceleration," 1971, p. 3. The relative gap in the level of labor productivity of basic workers in the two countries appears to have decreased according to Soviet estimates. According to Bazarova, "Questions," 1970, p. 37, the rate was 60 to 70 percent in 1969, whereas the Moskalenko materials appear to relate to 1970.

[13] Kasimovskiy, "Labor," 1972, p. 85. In the R.S.F.S.R., the level of mechanization in basic work is about 60 percent, in auxiliary work, less than 25 percent.

[14] Kostin, "Labor," p. 47.

ported to be over 80 percent,[15] and in construction over 60 percent.[16] To reduce these proportions of manual work would require a large investment in mechanization and specialization, perhaps beyond the levels of capital available. This problem is compounded by the agricultural difficulties of the last 2 years necessitating purchases of agricultural products whereas the capital might have been directed to increasing mechanization.

Reduction of redundant industrial labor might be achieved by implementation throughout Soviet industry of the Shchekino experiment which, among other provisions, permits the use of wages saved by cutting employment as incentives for both management and the remaining workers. Despite the increments achieved in labor productivity and increased wages in enterprises adopting this system, this experiment extends to only 300 enterprises, a miniscule percentage out of the approximately 52,000 enterprises on an independent balance. Furthermore, as described below, there are still many disincentives for managers to release workers from their rolls—the need for excess labor to cover additional assignments imposed during the year, to help in agricultural work, to build housing for the plant's workers, to ease the impact on work organization by maintaining the capability of "storming," (i.e., working very intensively or overtime at the end of a plan period to meet the plan goal), to preserve the wage-scale category classification of the enterprise, etc.

A more efficient use of worktime would also contribute to alleviating the shortage of labor in industry. The Research Institute of Gosplan R.S.F.S.R. has estimated that industrial labor productivity could be increased by 10 to 11 percent if the time lost in intra-shift work stoppages could be reduced by half its current level.[17] In agriculture, the average length of the workyear of collective farmers has only slightly improved even with the sanctioning of subsidiary industry on the farms in order to reduce seasonality of employment. Labor turnover also has an impact on the efficient use of worktime. With about one-fifth of industrial workers and about one-third of construction workers voluntarily quitting their place of work or being fired for infractions of labor discipline each year, labor turnover has been the subject of recent discussions as to whether or not restrictive legislative and administrative actions are required. Whether a change from the relatively free labor market now in existence is worth the certain unpopular political ramifications of reinstituting full job control as existed between 1940 and 1956, however, cannot be foreseen. There are some indications that this type of control has been proposed and rejected. Given one reported average of 28 days of worktime lost when a worker changes jobs, it can be roughly calculated that the complete elimination of labor turnover would result in an additional input of almost half a million workers. Obviously, the elimination or reduction of labor turnover would be of significance in easing the tautness in the market and in operating a planned economy by maintaining a relatively stable workforce with a known mix of occupations and skills.

Another manpower "reserve" which has been much discussed relates to the population of those small and medium-sized cities which lack the infrastructure to increase opportunities for employment. Many

[15] Kirichenko, "Questions," 1970, p. 5.
[16] Kasimovskiy, "Labor," 1972, p. 85.
[17] "The Reform," 1968, p. 35.

Soviet writers have maintained that the pool of female labor in the households of these cities is sizable. Perhaps a reservoir still exists in such cities throughout the country as well as in the west and south (especially in Central Asia as described below), and the latter is the basis for the statement by M. G. Pervukhin of Gosplan, that selective allocation of capital investments will be made to provide for more capital-intensive plants in areas with labor deficits and more labor-intensive production lines in labor surplus areas of the west and south.[18]

As indicated above, no significant improvement has been made toward increasing the average number of days worked in the socialized sector by collective farmers. The continuing necessity to obtain produce from the private garden plots in order to feed both the rural and urban population restrains administrative actions to restrict farmers from working on their plots; farmers still spend about one-third of their time on the plots and attempts by the government to have them spend much more time on the collective farm have not been successful. Soviet estimates indicate that the share of the collective farm population of able-bodied ages either working or studying full-time is quite high, and there is little reserve for additional inputs on either the private plots or the collectives. The extraordinarily large labor force employed on the farms, while underemployed in comparison with other countries, needs to be maintained at approximately the present level in order to obtain required production, especially after the recent agricultural difficulties and low or negative productivity increases.

The Ninth Five-Year Plan (1971–75) calls for additional investments in rural areas in order to induce the young to remain. Investment financed by the State for construction of cultural and personal services-type facilities in rural areas is anticipated at a level of 77.6 billion rubles, one and one-half times the outlays during the 1966–70 period, and three and one-half times those of the 1961–65 period. In addition, capital expenditures for this purpose from the collective farms' own assets will grow by one and one-half times in the current plan period.[19] The series of government decrees related to wages, pensions, and investment in rural services, beginning in 1966, had not succeeded in stemming the tide of young people from the farms and it is hoped that the present investment plans will be more successful. The population on the farms is aging, the birthrate in some rural areas is lower than in the cities, and productivity does not increase as needed. How the new investments, combined with the older decrees on wages and pensions, will change the pattern of out-migration remains to be seen.

In sum, there probably is an overall labor shortage in the Soviet Union as well as shortages in terms of geographic location, skills, and sectoral distribution. The shortages are apparent not only from a study of the numbers, but also from the institutional and pragmatic obstacles which prevent major transfers of personnel from auxiliary work, from regional factors, from unreasonable expectations for increases in labor productivity, etc. Thus, this is the result not only of demographic trends, but also of extremely difficult or unfeasible solutions to many economic and social problems. The economic and politi-

[18] "Productive," 1971, p. 2. Also see the interview with N. N. Nekrasov, Head of the Council for the Study of Productive Resources attached to Gosplan U.S.S.R., in "From Moscow," 1970, p. 2.

[19] Yemel'yanov and Rogachev, "Technical," 1971, p. 2.

cal costs of resolving the administrative, managerial, and technological questions involved may well be unacceptable.

Soviet planners are clearly concerned about the labor supply, and the thrust of all recent actions in the manpower field has been to ease a taut labor market. In contrast to the relative neglect of labor supply and demand problems in the earlier plan periods, great attention is now devoted to the subject. The formation of the new State Committees on Labor Resources Utilization in all 15 republics at the beginning of 1967, the constant references to labor productivity, and the very extensive expansion of work in the demographic and sociological fields all testify to the concern for both the short- and long-term labor constraints facing the Soviet Union.

II. Sources and Channels of Supply

Recognition by the Soviet Government that the labor supply situation is serious is evidenced by the issuance of a decree in December 1966 authorizing the creation of a state committee on labor resources utilization in each of the constitutent republics. This was the first major innovation in the labor field since the establishment 11 years earlier of the State Committee on Labor and Wage Problems. The latter committee is primarily concerned with wage- and norm-setting and has paid little attention to labor resources and supply; moreover, it does not have operational control over the labor market. The importance of the new committees is signified by the fact that central jurisdiction over them rests in the Labor Resources Department of Gosplan U.S.S.R., which has a vital interest in labor supply. The functions of these committees include labor recruitment and resettlement, the retraining and reassignment of surplus labor, the establishment of programs to provide the public with information on available jobs, research, and other such activities. They have become more and more the channel for directing labor to vacant jobs in various localities. There has been much discussion recently concerning the establishment of an all-union committee to coordinate their efforts and to ensure the increase in labor productivity, explicit in the title of the decree establishing the committees themselves (i.e., "On Measures of Securing the Greatest Growth of Labor Productivity in Industry and Construction").

A. The Population Base

If a comparison were to be made strictly of the numerical results of the estimated and projected changes in the population in the able-bodied ages in the Soviet Union during the past and present decade, it would appear that no labor supply problems exist. The annual increments in the present decade are much higher than those of the past decade due primarily to the entry of larger cohorts of 16 year olds each year. Although there is some tailing off from over 2.5 million persons per year in the 1971–75 period to over 2.1 million in the 1976–80 period, this latter figure still represents three times the level of annual increments in the able-bodied ages in the years 1959–65 (table 1). Beyond 1980, however, a potentially disastrous shift downward occurs with net annual increments of only about 590,000 and 610,000 per year in the two halves of the decade, respectively. Unless the capital and labor productivity gains envisaged for this decade (assuming a similar pattern for the last half compared with the known expectations for 1971–

75) are met, and assuming a demand for labor of about the same magnitude as in this 5-year plan period and no major in-migration of foreign labor, labor supply in the 1980's would appear to be very tight indeed.

TABLE 1.—ESTIMATES AND PROJECTIONS OF THE POPULATION OF ABLE-BODIED AGES: 1959 TO 1990

[As of Jan. 1, in thousands]

Plan period	Population of able-bodied ages[1]	
	Total increase	Average annual increase
	(1)	(2)
1959–65	5,173	734
1966–70	7,970	1,599
1971–75	12,849	2,570
1976–80	10,728	2,146
1981–85	2,944	589
1986–90	3,039	608

[1] Males, 16 to 59 years of age, females, 16 to 54 years of age.

Source: Unpublished estimates and projections prepared by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. For a discussion of the methodology used in these projections and a discussion of past and future population trends, see the paper by Leedy elsewhere in this volume.

The labor supply even during the current decade is not as bright as would appear at first glance. Hidden behind the aggregate increments are, in particular, the regional components. Based on equivalent population projections for the republics comprising Central Asia (Kirgizia, Tadzhikistan, Turkmenistan, and Uzbekistan) and Kazakhstan, as for the country as a whole, it appears that the shares of the increments from these five republics grow from approximately one-quarter of the net increase in the Ninth Five-Year Plan period for the U.S.S.R. as a whole to about one-third in the Tenth (table 2). Moreover, in the 1980's these projections indicate that there will be virtually no net increase in the population of able-bodied ages in the other 10 republics of the Soviet Union in the first half of the decade, and even a net decrease in their number in the second half.

TABLE 2.—ESTIMATES AND PROJECTIONS OF THE POPULATION OF ABLE-BODIED AGES IN 5 REPUBLICS (CENTRAL ASIA PLUS KAZAKHSTAN): 1971 TO 1990

[As of Jan. 1, in thousands]

Plan period	Population of able-bodied ages	
	Total increase	As a percent of national increase[1]
	(1)	(2)
1971–75	3,045	23.7
1976–80	3,593	33.5
1981–85	2,936	99.7
1986–90	3,162	104.0

[1] Column 1 divided by col. 1, table 1.

Source: Unpublished estimates and projections prepared by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. The projections were based on the population distribution by age and sex for all 5 republics combined from the census of Jan. 15, 1970, and on the following assumptions: that fertility will remain constant at the estimated 1971 level (gross reproduction rate equals 234); that mortality will decline by an amount consistent with an increase in life expectancy at birth of about 2.5 years between 1971 and 2000; and that net migration will be negligible over the entire projection period. (The net in-migration during the intercensal period 1959–70 accounts for only 4 percent of the 1970 population of the 5 republics.) The projections are consistent with the total population figures, the crude birth and death rates, and the age-specific fertility rates reported for the 5 republics. The survival rates used in the projections were derived from mortality rates by age and sex reported for the U.S.S.R. as a whole.

These results become more vivid when consideration is also given to the lower labor force participation rates prevailing in these five republics, to the lower mobility of their populations, to their lower levels of urbanization, and to their lower shares in nonagricultural State sector employment relative to the remainder of the country. Thus, in the Central Asian and Transcaucasian republics, some 80 to 86 percent of the population in the able-bodied ages work, whereas in the rest of the U.S.S.R., some 91 to 92 percent.[20] Lower mobility of the indigenous populations, *ceteris paribus*, would indicate that they are not a full increment to the potential labor supply for deficit regions. In addition to the general statements in the literature asserting their lower out-migration, the 1959 and 1970 census results indicate that in 1959 between 75 and 92 percent of each Central Asian nationality were living in their respective republic and in 1970 between 76 and 93 percent. Moreover, the bulk of the out-migration that does occur seems to be only to one of the neighboring four republics. Taking the five republics as a single bloc, 96 percent of the five nationalities were living in the area in 1959, and 97 percent in 1970. This pattern is very different from that of, for example, the Belorussians and Ukrainians; in 1959, 83 and 81 percent of these two nationalities resided in their respective republics, and in 1970 the comparable figures were 86 and 87 percent.[21] A major reason for the Central Asians remaining in their own area lies in the fact that, as indicated by the 1970 census, their command of Russian as a second language is not as extensive as it is in other non-Russian republics.[22]

For all five republics, moreover, the continuing high proportions of the population which is rural as well as the similarly low proportions of nonagricultural employment testify to their low rate of mobility. Thus, in 1971, the rural population was 42 percent of the total for the country as a whole, but in Kazakhstan it was 48 percent, in Turkmenistan it was 52 percent, and in the other three republics it was 62 or 63 percent.[23] Similarly, the proportion of the total population engaged in nonagricultural State sector employment (workers and employees) was 34 percent in 1971 for the total country, whereas in the four core Central Asian republics it was only between 18 and 23 percent and in Kazakhstan it was 29 percent.[24]

Unless the unused labor supply in these five republics moves to jobs or unless jobs are moved to them, their utilization is much less than optimum. Adding such other factors as poor organization of work, high shares of manual labor, labor turnover, and lower productivity gains than planned, the 3 million excess between the planned net employment increase in the State sector (9.9 million persons in the years 1971–75) and the increase in the population of able-bodied ages (12.8 million) is not as large as it appears.[25]

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[20] Zelenskiy and Voronin, "Labor," 1971, p. 30.

[21] Based on comparisons of the 1959 and 1970 census results published in *Pravda*, April 17, 1971, pp. 1 and 3. *Pravda* rather than the published 1959 census volumes was used in order to provide for some boundary changes which slightly affect the earlier published data.

[22] *Ibid.*, p. 3. See also Silver, "Social," forthcoming, for details on the lack of success in Russifying the Central Asian nationalities.

[23] *Nar. khoz. 1922–72*, pp. 9–11, 544, 556, 631, 644, and 669.

[24] *Ibid.*, pp. 9, 346, 544, 550, 556, 563, 631, 638, 644, 650, 669, and 675.

[25] See also Sergeyeva and Chizhova *Effektivneye*, 1971, pp. 34–41; Chizhova, "The Demographic," 1971, pp. 62–68; and Chizhova, "Several," 1971, pp. 37–42.

B. Households

Since at least the early 1960's many Soviet economists have argued that a major source of labor supply is the female population employed only in households. This potential has markedly changed for the future. The 1959 census results indicated that there actually was a large pool of such women. Of the 12,860,000 persons of able-bodied ages in the households not working in the socialized or private sectors at the time of the census, 89 percent were women. A total of 9,532,000 (92 percent of whom were female) lived in urban places. In addition, there were 5,035,000 persons (96 percent female) who were engaged in private agricultural activities.[26] Between the 1959 and 1970 census, the numbers of persons in the able-bodied ages who were employed only in the households or were engaged solely in private subsidiary agricultural activities dropped from 17.9 to 5.9 million persons.[27] The latter group is not only much smaller in number but members of it are much more difficult to recruit for labor force participation on the basis of even sketchy data from the 1970 census.[28] Thus, 91 percent of them are females, of whom two-thirds have children under 16 years of age. Other data indicate also that they are a relatively poorly qualified group in that 58 percent had no specialty, 19 percent had never worked, and another 54 percent had not worked in the past year. In terms of educational attainment, only 9 percent had either higher, incomplete higher, or specialized secondary education, 46 percent had completed general secondary or had attained an incomplete secondary education, and the remaining 45 percent had only a primary or less-than-primary education. Despite these limitations, and perhaps because of stringent manpower needs, some success in recruitment has been reported for the R.S.F.S.R. at least. Of the 2.3 million persons in the R.S.F.S.R. in households and private subsidiary agriculture according to the January 15, 1970 census, about 600,000 of them were working in the socialized sector by July 1971.[29] This latter number represents one-half the number who indicated a desire to work if certain conditions were met—distance from residence, hours of work, place in a child-care facility for their children, etc.

A sizable number of urban women (750,000) in 1959 were engaged in work on private plots. Whether or not an urban woman worked in the socialized economy, however, also apparently was affected by the size of the city in which she lived. As can be seen from table 3, two to two-and-one-half times as many women (and three times as many men, but at an insignificant level) were not working in the socialized economy in places under 20,000 population, as compared with those in the three cities with over a million inhabitants each. Job opportunities in the smaller cities are limited for women regardless of their work, and need for a relatively greater rate of investment to create jobs in those places is manifest.

[26] TsSU, *Itogi*, 1962, pp. 98–101.
[27] *Pravda*, April 17, 1971, p. 3.
[28] Kostin, *Povysheniye*, 1971, p. 110.
[29] Kasimovskiy, "Labor," 1972, p. 75.

TABLE 3.—PERCENT OF URBAN POPULATION OF ABLE-BODIED AGES NOT PARTICIPATING IN SOCIALIZED PRODUCTION, BY SIZE OF PLACE: JAN. 15, 1959

Size	Number of urban places	Percent of urban population not participating			
		Total	Women with children under 14 years of age	Women without children	Men
All urban places	4,612	15.8	8.6	6.4	0.8
1,000,000 and over	3	8.5	4.7	3.5	0.3
100,000 to 1,000,000	145	14.1	8.1	5.3	0.7
20,000 to 100,000	619	17.6	9.9	6.8	0.9
Under 20,000	3,845	19.8	9.8	9.0	1.0

Source: Ivanchenko, "Labor," 1965, p. 174.

Moskalenko estimated in 1962 that during the period 1960–80 some 5 to 6 million women could be recruited from the households and the private sector for work in the socialized economy.[30] Sonin predicted in 1965 that only 1 million could be drawn into the socialized economy.[31] Both were wrong; the success in recruiting has been remarkable. Accordingly to Lebedinskiy, the head of a Gosplan department, 10 million women were brought into production work in the socialized economy during the years 1961–65 alone.[32] Only 3.7 million were expected to be recruited during 1966–70 (compared with 3.2 million estimated below), far short of the 5 million planned and an indication that this reservoir was approaching depletion. According to early expectations, less than 1 million more women can be drawn from the households during the present plan period,[33] and some success has already been achieved; nonetheless alternative projections indicate a net withdrawal of about 200,000 persons from the socialized labor force to households and the private subsidiary agricultural sector during the years 1971–75 (see table 7).

During the years 1959–65, the household supplied 41.5 percent of the entire growth of employment in the national economy of the U.S.S.R., although it occurred primarily in the European regions. Thus, in Kazakhstan only 1.8 percent came from this source, in the Kirgiz S.S.R. 14.5 percent, in Turkmen S.S.R. 25.0 percent, in Tadzhik S.S.R. 28.4 percent, and Uzbek S.S.R. 30.0 percent. In contrast, in the R.S.F.S.R and in the Latvian and Estonian S.S.R.'s, it accounted for 50 percent or more of new employment.[34]

In part the success of this drive to get women out of the household has been based on their need to work and the availability of space in child-care institutions. The 1959 census showed that 14.5 million families (28.6 percent of the total number) were headed by women, and as one labor economist noted, "women could not but work, because their earnings are the basic source of income for the family."[35] The number of children in permanent kindergartens, nursery-kindergartens, and nurseries grew from 4,428,000 at the end of 1960 to 9,281,000 at the end of 1970, and is planned to grow to 11,228,000 at

[30] Moskalenko, "The Main," 1962, p. 4.
[31] Sonin, *Aktual'nyye*, 1965, p. 195.
[32] Lebedinskiy, "Basic," 1969, p. 28.
[33] *Ibid.*, and Mikhaylyuk, *Ispol'zovaniye*, 1970, p. 37.
[34] Litvyakov, *Demograficheskiye*, 1969, p. 198. The rate for Kazakhstan may be somewhat depressed due to the large-in-migration, but nonetheless it must have been relatively low.
[35] *Ibid.*, p. 103.

the end of 1975, or from 13 to 32 and then to 37 percent, respectively, of the number of children under 7 years old.[36]

A major drive to create part-time job opportunities for women was begun in 1966–67. Part-time work was authorized in new plants of the garment industry, and increased production on a cottage-industry basis was planned.[37] In the middle of 1969, further impetus was given to the hiring of the housebound, the aged, and the maimed through issuance of a directive entitled "On the Wide Drawing-in of Pensioners, Invalids, and Females Employed in Households into Enterprises for the Production of Consumer Goods." Republican councils of ministers, as well as ministries and agencies of the U.S.S.R., were ordered to set up special enterprises and shops to use the labor of pensioners and invalids. Production combines and firms using cottage-industry workers on a full- or part-time basis were also to be set up. By October 1969, the R.S.F.S.R. Ministry of Light Industry was employing about 7,000 persons at home, and it was expected to expand the number shortly thereafter.[38] By 1972, there were some 100,000 part-time workers active in the R.S.F.S.R.[39] Efforts of this kind may have been the means for drawing the significant numbers of relatively unskilled, ill-educated housewives or older people into at least part-time work. The full results of the special inquiries made in the 1970 census of all households with members of able-bodied ages not working or who worked only a partial year will provide the planners with detailed statistical data to assess the success of their efforts, and more importantly, give a new benchmark as to the current size of this labor "reserve."

C. Educational System

Most young people entering the labor force come directly from an educational institution, and the educational system has long been used by the Government to regulate the flow of these youths to work. Systematic national data showing the origin of labor force entrants from all levels of school, or the disposition of all graduates from schools are not published. Two sources, however, contain information on the postgraduate activities of students who completed secondary schools in the R.S.F.S.R. and the Ukraine during the years 1957–66 (table 4). Approximately half of these graduates had gone directly into the labor force, although some in this category may have continued their school on a part-time or correspondence basis. It is probable that in most other republics the proportion entering the labor market directly would be higher. Approximately one-quarter to one-third of the graduates went on to full-time study in higher or specialized secondary schools. The proportion entering higher schools increased sharply in 1963, reflecting the small cohort graduating from secondary schools in that year. The proportion of graduates going on to higher schools

[36] The number of children in permanent preschool child-care institutions is from TsSU, *Nar. obraz.*, 1971, p. 128. The number of children in ages 0–6 years is from unpublished estimates and projections of the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. These were or are projected to be 34,629,000 on January 1, 1961, 29,034,000 on January 1, 1971, and 30,124,000 on January 1, 1976. The reduction in size of this age group reduces the level of potential demand for space in these facilities and contributes to the increased proportions achieved or planned. The 1975 plan figure is from Gosplan, *Gosudarstvennyy*, 1972, p. 353.

[37] Feshbach, "Manpower," 1966, p. 757.

[38] "The Council," 1969, p. 11.

[39] Glazyrin, "Short," 1972, p. 5. According to this source, perhaps 9 to 10 times more could work part-time if enterprise managers were not reluctant to hire them due to current regulations.

follows the trend in enrollment at the higher school level. The degree of direct access to higher schools has often been reduced on the explicit basis of forcing secondary school graduates to take jobs when the need is felt.

TABLE 4.—DESTINATION OF SECONDARY SCHOOL GRADUATES IN THE R.S.F.S.R. AND THE UKRAINIAN S.S.R.: 1957 TO 1966

[In percent]

Destination	1957	1959	1960	1963	1966
All graduates:					
R.S.F.S.R.	100.0	100.0	100.0	100.0	100.0
Ukrainian S.S.R.	(1)	100.0	100.0	100.0	100.0
A. To full-time study:					
R.S.F.S.R.	38.2	37.2	39.9	51.3	40.7
Ukrainian S.S.R.	(1)	32.4	32.5	40.3	38.5
1. Higher educational institutions:					
R.S.F.S.R.	10.4	11.9	12.4	34.3	18.9
Ukrainian S.S.R.	(1)	6.0	4.5	21.1	13.4
2. Tekhnikums and other specialized secondary schools:					
R.S.F.S.R.	16.0	14.2	13.3	10.2	12.0
Ukrainian S.S.R.	(1)	13.6	12.4	11.9	11.7
3. Vocational-technical and technical schools:					
R.S.F.S.R.	6.1	8.4	10.9	4.1	4.5
Ukrainian S.S.R.	(1)	9.2	11.1	5.0	7.3
4. Other educational institutions: [2]					
R.S.F.S.R.	5.8	2.7	3.3	2.7	5.3
Ukrainian S.S.R.	(1)	3.6	4.5	2.3	6.1
B. To work in the national economy:					
R.S.F.S.R.	45.1	50.7	51.1	41.5	50.9
Ukrainian S.S.R.	(1)	57.0	60.1	52.1	54.9
C. Other (not working or studying, drafted, and unknown):					
R.S.F.S.R.	16.7	12.1	9.0	7.2	8.4
Ukrainian S.S.R.	(1)	10.6	7.4	7.6	6.6

[1] Not available.
[2] Although not stated in the source, this category probably includes military educational institutions.

Source: 1957: Nemchenko, "Professional 'naya", 1969, p. 44. 1959–66: Zarikhta and Nazimov, "Ratsional 'noye", 1970, p. 133.

Data comparing the numbers of general secondary school graduates and admissions to the full-time division of higher educational institutions in the U.S.S.R. during the years 1951–71 and the planned level in 1975 [40] are presented in table 5. These figures, however, are incomplete in that they omit the numbers of persons who had completed secondary education in tekhnikums and in vocational-technical schools. Thus, in 1971, the reported total of 2,708,000 graduates of secondary schools is limited only to those graduating from general secondary schools; the total including graduates of the other two types of schools should be 3,140,000.[41] Unfortunately a consistent series including all of these graduates is not available. The essential point here is that although the trend indicated by the percentage figures in table 5 for the years since the mid-1960's imply that only about 20 percent of secondary-level graduates can expect to go on to higher school on a full-time basis, actually the proportion is lower. In 1971, for example, instead of 19.1 percent as shown in the table, the 516,000 admissions in

[40] Figures given in this section related to the plan quantities for 1975 are subject to question on the basis of figures given in Gosplan, *Gosudarstvennyy*, 1972, pp. 308–315, for the past which could be checked against reported TsSU figures in *Nar. khoz. 1922–72* and TsSU, *Nar. obraz.*, 1971, passim. While the disparity is only in the low thousands range, it is disturbing; the disparity, moreover, is in both directions, though usually the Gosplan figures are lower.
[41] The full figure is reported in *Trud*, February 20, 1972, p. 2.

the fall of 1971 represent only 16.5 percent of the 3,140,000 graduates in the year. Moreover, the percentage figure for a given year is exaggerated because all persons admitted to higher schools in that year are not necessarily graduates of secondary schools in the same year; a sizable proportion could come from graduating classes of previous years. While the ratio of admissions to graduates from general secondary schools will increase in 1975, due to the smaller graduating class anticipated, admissions to full-time divisions of higher schools will increase between 1970 and 1975 at only about one half the rate as during the previous 5 years. The share that full-time admissions are of all admissions will increase only by 5 percentage points during the present plan period, from 55 in 1970 to 60 percent in 1975.[42] The competition for entrance will be almost as fierce as has been the case to the present. Short-term gains for the labor force obtained by rstricting larger numbers of secondary school graduates from entering full-time programs in higher schools may be at high cost in terms of impact on meeting future long-term needs for highly trained manpower.

TABLE 5.—GRADUATIONS FROM GENERAL SECONDARY SCHOOLS AND FULL-TIME ADMISSIONS TO HIGHER SCHOOLS: 1950 TO 1975

[Absolute figures in thousands]

Year	Graduations from general secondary schools	Full-time admissions to higher schools	Admissions as percent of graduations
1950	284.0	228.4	80.4
1951	340.0	245.2	72.1
1952	416.0	249.0	59.9
1953	579.0	265.1	45.8
1954	1,014.0	276.2	27.2
1955	1,247.0	257.2	20.6
1956	1,454.0	231.2	15.9
1957	1,509.0	219.7	14.6
1958	1,574.0	215.5	13.7
1959	1,373.0	227.1	16.5
1960	1,055.0	257.9	24.4
1961	915.0	279.4	30.5
1962	836.0	312.1	37.3
1963	902.0	339.0	37.6
1964	1,414.0	356.2	25.2
1965	1,340.0	378.4	28.2
1966	3,268.0	427.1	13.1
1967	2,355.0	436.9	18.6
1968	2,508.0	453.2	18.1
1969	2,549.0	475.2	18.6
1970	2,591.0	500.5	19.3
1971	2,708.0	516.6	19.1
1975 (plan)	2,600.0	582.5	22.4

Source: "Graduations from general secondary schools:" Gosplan, "Gosudarstvennyy", 1972, p. 369; TsSU, "Nar. obraz.", 1971, p. 102; and "Nar. khoz. 1922–72," p. 427. Admissions to higher schools: Gosplan, "Gosudarstvennyy", 1972, p. 313; "Nar. khoz. 1922–72," p. 440; "Nar. khoz. 70," p. 644; Poletayev, "Rabochiy," 1971, p. 91; and Goodman "Estimates," 1970, p. 7.

[42] TsSU, *Nar. obraz.*, 1971, p. 187, and Gosplan, *Gosudarstvennyy*, 1972, p. 314.

Much stress has recently been placed on the growth of vocational-technical schools, and there has been a large increase in the number of persons trained in these schools. For example, in 1960 there were 50 percent more graduates than in 1950, but in 1970 there were three times the number in 1950.[43] An approximately equivalent increase also occurred in the higher types of vocational-technical schools—the technical schools—which also offer general secondary education. For many years students were not willing to enter vocational-technical schools after completing general secondary schools, because regulations prohibited them from beginning full-time study in higher schools for 4 years after graduation. In 1967, however, the rules were changed to permit direct entry to higher schools for persons who graduated from vocational-technical schools with outstanding ratings. A similar rule for permitting immediate access to higher schools is now in force for specialized secondary school graduates.[44] These changes in rules undoubtedly are reflected in the proportionately larger numbers receiving secondary school education outside the general educational schools. According to the Chairman of the State Committee on Vocational-Technical Education, A. Bulgakov, more than 1,400,000 students will be admitted and over 500,000 will graduate from secondary vocational-technical schools in 1975. These students will comprise at least one-third of the total enrollment anticipated for full-time vocational-technical schools of all types in 1975;[45] admissions to all full-time vocational-technical schools is projected to reach 38 percent of the cohort attaining 16 years of age in that year, more than half again as many as its share in 1965.

Enormous progress has been made toward increasing enrollment in the various school systems, but some slowdown can be foreseen for the present plan period. During the years 1966–70 the vocational-technical education system was expected to graduate 5.7 million skilled workers from its day (full-time) division, or 40 percent more than in the previous 5-year period; a total of 5.8 million persons actually graduated. In the present plan period the system is expected to graduate about 7.6 million from its day division (out of 9.1 million from all divisions), or slightly over 30 percent more than in the previous plan period. The higher and specialized secondary schools were scheduled to train about 7 million specialists from all divisions during the years 1966–70 and the actual number was 7,064,000. This was 64 percent more than in the previous plan period. In the 1971–75 plan, the higher and specialized secondary schools are scheduled to graduate 8.9 million

[43] *Nar. khoz. 1922–72*, p. 355.
[44] Brvukhovets, "Technicians," 1970, p. 3; "On Measures," 1969, p. 1; and Mitrofanov, "At a Big," 1967, p. 2.
[45] See, Bulgakov, "New," 1972, p. 2, and ———. "The Training," 1971, p. 10. The number of admissions had been revised upwards to reflect the enhanced position of these schools. The Bulgakov article released in 1972 cites the number of students to be admitted to full-time studies as 1,400,000, up from the 1,250,000 reported in his 1971 article.

persons, or 25 percent more than in the 1966–70 period.[46] Shifts in priorities also may be seen from the following: V. Yelyutin, Minister of Higher and Specialized Secondary Education of the U.S.S.R., in a speech summarized in October 1971 indicated that the Ninth Five-Year Plan directives called for 4.6 million graduates with higher education and 4.4 million with specialized secondary education. By the time the plan was fully adopted these numbers had been altered to call for 3.4 million *vuz* (*vyssheye uchebnoye zavedeniye*—higher educational institution) graduates and 5.5 million specialized secondary school graduates, for the identical total of about 9 million persons.[47] The slowdown in the rate of inputs of skilled manpower to the labor force from the educational pipeline during the 1971–75 period may be an important element in the slower employment growth foreseen in the plan.

In respect to the needs of agriculture, the expansion of educational opportunities has been of questionable value. The farms have great need for a better, more skilled labor force, but at the same time education has been the major motive and catalyst for withdrawal of young persons from the rural scene, regardless of whether or not they study agricultural-related subjects. It is reported that more than 60 percent of secondary school graduates and more than 90 percent of higher school (*vuz*) graduates from rural areas settle in urban areas.[48] These settlement patterns inhibit realization of plans for substantial increases in labor productivity by leaving agricultural work to older, less productive workers who are largely females. Although, as indicated above, the vocational-technical schools have expanded rapidly during the past decade, the requirements of collective and state farms for graduates have remained unmet. The farms received less than one-half of their requirement for 1,235.000 vocational-technical school graduates during the years 1966–70. For example, only 18,000 of the 40,000 electricians needed were actually acquired. It is not only agriculture that suffered, however; industry obtained only 12 to 15 percent and construction only 30 percent of their planned needs for vocational-technical school graduates.[49] Thus, despite the fulfillment of the official plan the actual needs remain much higher for vocational school graduates.

The head of the R.S.F.S.R. State Committee on Labor Resources Utilization, K. Novikov, writing in June 1970, said that "in the next few years" young people will be the source for meeting about 90 percent of the demand for additional labor.[50] Most of these young people will come as graduates of the secondary, vocational-technical, or higher schools. It is worthy of comment, however, that during the 1960's the proportion of all workers and employees who were under

[46] Gosplan, *Gosudarstvennyy*, 1972, p. 354; TsSU, *Nar. obraz.*, 1971, p. 190; *Izvestiya*, February 4, 1971, p. 2; Kotov "Rates" 1971, p. 6; *Nar. khoz*, 69, p. 684; and "Vocational," 1968, p. 4.

[47] Cf. Tass Summary of Yelyutin report, in "Tasks," 1971, p. 2, and Gosplan, *Gosudarstvennyy*, 1972, p. 354.

[48] Sukhomlinskiy, "Special," 1969, p. 2. In 1970, only 5 percent of the graduates of Leningrad oblast secondary schools remained in the villages. Il'in, "How," 1972, p. 2.

[49] Zelenskiy, "Who," 1969, p. 2, and Seryakov, "For Whom," 1968, p. 2.

[50] Novikov, "Man," 1970, p. 2.

18 years of age increased significantly. Few persons complete secondary or vocational-technical school under age 18, but the data in table 6 suggest that all branches have been accepting youths aged 17 or younger as regular, registered employees. Many of these young employees probably have not completed a course above the elementary-intermediate level. This situation may well be another indicator of a taut labor market, but the percentages shown in the table cannot be expected to rise much higher.

TABLE 6.—PERSONS UNDER 18 YEARS OF AGE AS PERCENT OF ALL WORKERS AND EMPLOYEES, BY BRANCH OF THE ECONOMY: 1948 TO 1967

Branch of the economy	May 1, 1948	May 5, 1950	Apr. 1, 1958	Mar. 31, 1961	1963 [2]	June 1, 1967
All branches	3.2	2.1	1.5	0.8	1.9	2.9
Industry	4.9	2.9	2.0	1.1	2.5	4.1
Machine-building and metalworking	(1)	3.7	(1)	(1)	3.8	4.8
Construction	3.6	2.1	3.6	1.2	2.7	4.2
Transport and communications	2.0	1.0	1.0	0.5	1.3	2.4
Agriculture	5.9	4.5	1.5	1.0	(1)	(1)
State farms and subsidiary State agriculture	(1)	5.6	(1)	(1)	2.2	2.6

[1] Not available.
[2] Date not reported.

Source: 1948, 1958, and 1961: "Zhenshchiny", 1963, p. 164. 1950, 1963, and 1967: "Zhenshchiny," 1969, p. 158.

D. Pensioners

A number of steps have been taken to draw pensioners back into active work status. In part, this reflects the general aging of the population as seen by the relative share of the population above the working ages (i.e., males, 60 years of age and over; and females, 55 years of age and over) which increased from 12 percent of the population at the beginning of 1959 to 15 percent at the beginning of 1970. [51] The 1956 pension law contained provisions which essentially penalized pensioners for returning to work, but beginning in 1964 the government has initiated several changes making it financially worthwhile for pensioners to seek a job once again. In addition, the scope of the 1964 law has been broadened to cover persons in more branches of the economy and regions with labor deficits. A law passed in 1964 brought collective farmers under coverage of the national pension system, and many older farmers returned to work to earn eligibility. Beginning in 1968, however, the minimum age for eligibility was reduced to the level of the state sector (age 60 for males and 55 for females); the precise result of this reduction in age requirements is not known, but presumably many farmers took advantage of it and withdrew from the labor force.[52] The legislation promulgated on December 31, 1969, extended the liberalized return-to-work provisions through 1975. The

[51] Baldwin, *Estimates*, 1973, pp. 15–16.
[52] See "Labor," 1968, p. 66.

title of the directive makes the purpose completely clear: "On Measures for the Further Raising of Material Interest of Old-Age Pensioners Able to Work in Continuing to Work After Being Placed on Pension." [53]

The additional supply forthcoming to the labor force between January 1, 1961 and 1971 from the change in regulations probably is somewhat less than one million pensioners (see table 7, below). It appears that in 1969–70 about 4 million persons of pension age worked in the socialized economy. This number does not include those working in the private agricultural sector, who would raise it significantly.[54] While most pensioners working in the State sector are engaged in agriculture, approximately one-third work in industry, and many others have jobs in health services, education, science, and trade and public dining.[55]

The value received by having pensioners return to work is more than twice the costs involved, according to Soviet calculations. A survey taken among a large group of pensioners in Latvia indicated that some 40 percent of men 60–64 years of age and women 55–59 years of age would continue work if they could receive their pension in full, as well as wages. It was estimated that the costs to the republic for regular wages paid to the surveyed pensioners would be some 7.4 million rubles, but the national income of the republic would increase by 24.5 million, a net marginal return to the government of 17.1 million rubles.[56]

Some discussions have taken place in the Soviet Union about raising the able-bodied ages by 5 years for both sexes and making the additional 5-year span a quasi-working age; simultaneously there are discussions on raising the lower age from 16 to 18 to recognize the extended length of schooling. The 4 million persons of pension age working in the socialized economy, plus an additional half to three-quarters of this number for overaged persons working in the private agricultural sector, amounts to 6 to 8 million. These persons represent 60 to 70 percent of the total population aged 60–64 for males and aged 55–59 for females (11.3 million) if it is assumed that all were in these age groups.

Other data indicate that the number of working pensioners among workers and employees increased from 532,000 at the beginning of 1960 to 2,297,000 on July 1, 1969. The numbers of old-age pensioners working contribute differentially to the economy of specific localities. Thus, after increasing from 0.9 percent of all workers and employees in 1960, they tripled their share and represented 2.6 percent of such personnel in the country in 1969, but more than twice that proportion in Moscow in 1969 (5.6 percent, or 238,000 persons, which represents

[53] Solov'yev, "Pension," 1970, pp. 137–142; "New Pension," 1970, p. 4; and Feshbach "Manpower," 1966, pp. 715–717.
[54] See Acharkan, "Stimulating," 1972, p. 135; Feshbach, "Population," 1970, p. 65; and Kostakov and Litvyakov, *Balans*, 1970, p. 13.
[55] *Ibid.*, p. 16.
[56] Parfenov and Ivanov, "Vertical," 1969, p. 2. Slightly different data are given in Kostin, *Povysheniye*, 1971, pp. 190–191.

one-quarter of all old-age pensioners) where there is a labor shortage. A similar ratio exists in Leningrad and is reported to be high also in the Baltic republics, especially in Estonia.[57]

E. Other

1. FOREIGN LABOR

A recent trend toward the use of foreign labor is manifesting itself. Still small in size, foreign labor could prove to be important in helping to clear up bottlenecks in certain key areas. For example, as of March 1970, there were 2,000 Bulgarians working as loggers in the labor-deficit, hardship area of Komi A.S.S.R. The number of Bulgarians is expected to increase to 9,000 by 1975, of whom 6,000 are to be in logging. A Radio Budapest broadcast of January 1, 1971, indicated that the *Gastarbeiter* movement should become "quite natural" among Eastern European countries during the 1970's—although it is not certain that the comment was meant to include the Soviet Union. Over 7,000 North Koreans are reported to be cutting timber in the Soviet Far East, another area in which it is difficult to get Russians to settle.[58] Approximately 650 Italian technicians and engineers were employed in the new automobile factory at Togliatti at the end of 1970.[59] An agreement has also been reached between the Soviet Union and Finland for Finnish workers to build a hotel and a hydroelectric station, and to cut timber. The number of Finns is not known, but the principle seems to be established that the Soviet Government will accept workers from other than Bloc countries. If this practice of using workers from other countries should grow significantly it could serve to ease the tight labor situation, particularly in selected local areas.

2. INVALIDS

The directive of mid-1969 noted in the section on pensioners also contained provisions designed to encourage invalids to seek productive work. In earlier years invalids frequently worked in special production units of the producers' cooperative system. After the abolishment of these cooperatives in October 1960, however, many invalids found it difficult to find work. In July 1962, 2.5 million invalids were working on collective and state farms and in nonagricultural enterprises and organizations. The share of invalids of the third category (the least disabled who are primarily in the able-bodied ages) who were in the active workforce increased in the last decade. In December

[57] *Ibid.*, p. 190. For 1960, the share of working pensioners of all workers and employees was derived by dividing the 532,000 reported for the beginning of 1960 by the average of the annual average numbers of workers and employees in 1959 and 1960. *Trud v SSSR,* 1968, p. 22.

[58] Radio Free Europe Research, *Hungary,* January 19, 1971, p. 4; Feshbach and Rapawy, "Labor," 1970, p. 72; and TASS, Ecotass, *Economic,* June 10, 1968.

[59] *Newsweek,* December 21, 1970, p. 81.

1963 it was reported that 70 percent of all persons in this category in the R.S.F.S.R. were working; by the beginning of 1970 the proportion had increased to 79.6 percent.[60] A quota system for hiring war invalids was initiated in 1965, according to which an enterprise is required to employ such invalids in an amount up to 2 percent of its workforce, although the enterprise can voluntarily hire more.[61]

3. DUAL JOBHOLDERS

In a manner similar to that followed for pensioners, the authority for a worker or employee to hold two jobs has been extended time and again. The primary area in which this occurs, however, is in the educational and medical fields, where a short workday is also authorized. During the 1960's many institutions and organizations in these fields could not have functioned without the widespread practice of dual jobholding. In 1964, for example, 25 percent of all doctors in the Ministry of Health Services held a second job. Dual jobholding also was an important factor in meeting demands for middle medical personnel, but the supply of both categories of personnel was still expected to fall short of requirements for the 1966–70 period.[62] In late 1968, the 1964 ruling which permitted persons to hold two jobs during the period 1964–68 was again extended for another 5 years, from 1969 through 1973.[63]

4. VOLUNTEERS

Volunteer labor, either as a regular practice or as an occasional activity on special days, such as the "Communist Saturday" of April 11, 1970, scheduled in honor of Lenin, and that held on April 17, 1971 (when 120,000,000 people at least showed up as 'volunteers') and April 15, 1972, can achieve large savings in wage costs to the state. There appears to be around eight "Black Saturdays" per year, "Volunteers" have long been used for such diverse activities as building and repairing roads, planting trees, and harvesting crops. In 1971, there were to have been 400,000 students who volunteered their labor in the All-Union Construction Detachment, a manyfold increase from the 350 students involved 13 years earlier. The estimated value of their work, 600 million rubles, a not insignificant sum, was to be performed at 10,000 agricultural and industrial sites, 6,000 housing projects, 1,500 cultural and personal services sites, 580 general schools, and 90 vocational schools. In 1972, the number of students involved was to have increased to 500,000.[64]

In 1957, Khrushchev initiated a policy of encouraging volunteers to perform professional work in local governmental activities, and by 1962 over 2 million persons were working in nonpaid and nonstaff positions of lower-level city and rayon administration.[65] This increase

[60] Khankin, "Perspectives," 1970, p. 26, and Lykova, "Social," 1963, p. 46.
[61] Feshbach, "Manpower," 1966, p. 718.
[62] *Ibid.*, pp. 754–755.
[63] "On the Retention," 1969, p. 2. Unusual details of impropriety on the part of the heads of organizations of the Moscow City Executive Committee who hold second jobs within their own subordinate organizations are given in "On Inadequacies," 1970, pp. 4–6.
[64] "500,000," 1972, p. 1; "The Saturday," 1972, p. 1; "Horizons," 1971, p. 1; and Savel'yev, "The Work," 1971, p. 9. According to a West German publication, emergency student brigades were formed in 1971 to fight erosion problems on the farms. This system became formalized and student work plans for 5 years thereafter were prepared by the Ministry of Agriculture U.S.S.R. See *Die Landwirtschaft*, 1971, p. 3.
[65] Feshbach, "Manpower," 1966, p. 722.

in volunteer work accompanied a drive to reduce the number of regularly employed personnel in government administration, and no doubt contributed significantly to the success of the drive. In fact, between 1950 and 1960 paid employment in government administration was cut by one-third, from 1.8 to 1.2 million workers and employees (table 8). By 1969, this employment had crept back up to its 1950 level, and a new drive was initiated to cut it again.[66] The success of this recent drive is problematical, however. The supply of "volunteers" surely has diminished, due to the demand for paid workers in all branches and the reemployment of many pensioners, but the need to staff government offices will remain.

F. Summary

On the basis of new information available, it is possible to provide a systematic explication of the basic sources of labor supply to the state sector (i.e., workers and employees), and to determine the increments in the numbers of full-time students in the past two 5-year periods, and in the current 5-year plan period (table 7). The shifting structure of the sources of labor supply alluded to in the foregoing discussion is striking. Thus, rising from only about 30 percent in the 1961–65 period, the share of the increment from the net growth of the population in the able-bodied ages doubles in the next 5-year period and in the 1971–75 period represents 92 percent of the entire growth of employment in the state sector.

Conversion of collective farmers to workers and employees, either through conversion of their farms to state farms or through migration to the cities to work in nonagricultural employment is expected to contribute less than 10 percent of the increase during the present 5-year plan period. This share may even be somewhat lower if one considers the need to retain farm labor in order to compensate for the agricultural difficulties of the past 2 years. The households and private subsidiary economy which was such an important supplier is now considered to be totally dried up. After providing more than half the supply during the first part of the 1960's, there is now anticipated even some withdrawal back to households, perhaps as a reflection of the increasing concern over the drop in the birthrate and a signal of a policy change aimed toward encouraging births.[67] The zero contribution of underage (as well as overage) persons to the growth in employment in the years 1971–75 is probably a concomitant of the effort to achieve universal 10-year education and the increase in the number of full-time students. Any increase in the number of students implies a corresponding decrease in the number of working pensioners and is compatible with the large number added during the previous 5 years and the expectation that there are relatively few pensioners remaining who could be induced to reenter the labor force under present regulations.

[66] Rapawy, *Comparison*, 1972. passim.

[67] Support for the withdrawal from the labor force to the households shown in table 7, derived from information in Kostin and Kostin, *Vsemerno*, 1971, p. 13, is given by Sergeyeva and Chizhova, *Effektivneye*, 1971, p. 20. However, *Ekonomicheskaya gazeta* of April 1972 (no. 15, p. 1) indicates that the households and the private subsidiary economy will provide 1.5 percent of the increment during the Ninth Five-Year Plan period, rather than a withdrawal of 1.5 percent. It is strange that the percentage share is exactly the same in both cases, but the signs are different.

TABLE 7.—SOURCES OF LABOR SUPPLY TO THE STATE SECTOR AND INCREASE IN NUMBER OF FULL-TIME STUDENTS, BY 5-YEAR PERIOD: 1961 to 1975

[Absolute numbers are in thousands]

Source	1961–65		1966–70		1971–75	
	Percent (1)	Number (2)	Percent (3)	Number (4)	Percent (5)	Number (6)
A. Total increase in state sector employment and full-time students	100.0	18,777	100.0	13.885	100.0	13,921
1. Natural growth of the population in the able-bodied ages	29.1	5,464	57.4	7,970	92.3	12,849
2. Release of labor resources from collective farms	16.7	3,136	12.8	1,777	9.2	1,281
3. Able-bodied population drawn into socialized production from the households and private subsidiary economy	53.1	9,971	23.4	3,249	−1.5	−209
4. Increase in the number of working pensioners and young persons under 16 years of age	1.1	207	6.4	889	0	0
B. Less increase in number of workers and employees	(1)	14,883	(1)	13,271	(1)	11,114
C. Increase in number of full-time students	(1)	3,894	(1)	614	(1)	2,807

[1] Not applicable.

Source: Sec. A: Based on the percent distributions given in Kostin, "Vsemerno," 1971, p. 13, and estimates and projections of the population in the able-bodied ages prepared by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. For each time period, the growth in the latter figure was divided by the percentage figure to produce the total increase. The percentages were then applied to this total to produce the absolute figures. At least 1 figure derived in this manner was confirmed by a reported figure. That is, there is but a minor difference between the estimate of 9,971,000 persons from the household and the private subsidiary economy given here for the 1961–65 period and a figure of 10.1 million reported in several sources (see, for example, Kostakov, "Employment," 1971, p. 84). Sec. B: Table 14. Sec. C: Residual.

Thus, given the constraints on the labor supply, the relative scarcity of hard currency to buy all the capital equipment needed to raise the capital/labor ratios, the exacerbation of the situation caused by 2 years of agricultural difficulties, the continued underfulfillment of labor productivity goals, and assuming no significant entry of foreign labor, few or no choices appear to be open other than to reduce the goals of the plan to reflect the amount and quality of labor available. Could a significant demobilization be subject to consideration by the Soviet Government and Party?

III. Civilian Employment

A. Past Employment

The total number of workers and employees in the national economy increased by nearly 50 million during the last two decades, from 40.4 million in 1950 to 90.2 million in 1970 (table 8). Growth during the 1950's amounted to 21.6 million, of 43 percent of the rise in the 20-year period; thus the larger portion of the growth occurred in the 1960's—28.2 million. During the 7-year plan period, 1959–65, the number of workers and employees rose by 20.9 million, representing an average annual amount of nearly 3.0 million and an average annual rate of 4.6 percent. Growth dropped off during the recently completed 5-year plan period, 1966–70, when the total rise in numbers of workers and employees was 13.3 million—an annual amount of about 2.7 million and an annual rate of 3.2 percent. (Workers and employees are

employed in the state sector only; the measure of annual average employment shown in table 14 includes collective farmers and persons employed in the private sector, and indicators of growth during the above years for this measure are much lower.) The decreasing indicators of growth continue into the current 5-year plan period when the projected increase in the number of workers and employees is only 11.1 million, or 2.2 million less in the aggregate than the preceding period. Similarly, the annual increments drop by 500,000 and the annual average rate drops by almost a full percentage point, to 2.3 percent per year.

TABLE 8.—ANNUAL AVERAGE EMPLOYMENT IN THE STATE SECTOR, BY BRANCH OF THE ECONOMY: 1950 TO 1971

[In thousands of persons; figures in parentheses were interpolated linearly]

Year	Total	Agriculture	Nonagricultural branches														
			Total	Industry	Construction	Forestry	Transport	Communications	Trade, public dining, material-technical supply and sales, and procurement	Housing-communal economy and personal services	Health services	Education and culture	Art	Science and scientific services	Credit and insurance organizations	Government administration	Other
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1950	40,420	3,437	36,983	15,317	3,278	444	4,117	542	3,360	1,371	2,051	3,315	185	714	264	1,831	194
1951	[1] 42,300	(3,565)	38,735	16,230	3,414	(453)	(4,370)	(554)	(3,444)	(1,428)	(2,139)	(3,434)	(194)	(772)	(263)	(1,809)	231
1952	[1] 43,900	3,693	40,207	16,873	3,578	462	4,623	565	3,528	1,485	2,226	3,553	(202)	829	262	1,786	235
1953	[1] 45,400	4,026	41,374	17,617	3,685	416	4,794	582	3,496	1,519	2,308	3,647	(211)	860	263	1,726	250
1954	[1] 49,100	5,966	43,134	18,499	4,064	(402)	(4,925)	(596)	(3,626)	(1,551)	(2,468)	(3,817)	(219)	(926)	(264)	(1,544)	233
1955	50,251	6,041	44,210	18,984	4,119	389	5,056	611	3,756	1,583	2,627	3,988	228	992	265	1,361	251
1956	51,869	5,954	45,915	19,702	4,523	390	5,232	624	3,826	1,666	2,736	4,103	(245)	1,094	266	1,342	166
1957	54,460	6,628	47,832	20,357	5,014	377	5,368	641	4,017	1,721	2,892	4,250	(263)	1,208	261	1,294	169
1958	56,005	6,005	50,000	20,997	5,495	367	5,681	664	4,190	1,754	3,059	4,378	(280)	1,338	260	1,294	243
1959	57,867	5,568	52,299	21,670	5,921	352	5,984	691	4,389	1,815	3,245	4,556	(298)	1,474	260	1,273	371
1960	62,032	6,793	55,239	22,620	6,319	359	6,279	738	4,675	1,920	3,461	4,803	315	1,763	265	1,245	477
1961	65,861	7,496	58,365	23,817	6,541	378	6,518	790	5,010	2,030	3,677	5,165	346	2,011	277	1,295	510

1962	68,300	7,817	60,483	24,677	6,523	389	6,677	832	5,253	2,096	3,818	5,521	340	2,213	283	1,316	545
1963	70,526	7,954	62,572	25,442	6,684	399	6,841	877	5,487	2,182	3,933	5,835	353	2,370	289	1,308	572
1964	73,258	8,168	65,090	26,317	6,883	404	7,054	928	5,752	2,282	4,082	6,204	362	2,497	296	1,354	675
1965	76,915	8,704	68,211	27,447	7,301	402	7,252	1,007	6,009	2,386	4,277	6,600	370	2,625	300	1,460	775
1966	79,709	8,894	70,815	28,514	7,549	409	7,364	1,073	6,261	2,489	4,427	6,895	380	2,741	313	1,546	854
1967	82,274	8,836	73,438	29,448	7,880	412	7,467	1,123	6,575	2,674	4,545	7,172	387	2,850	329	1,651	925
1968	85,100	8,899	76,201	30,428	8,149	421	7,606	1,187	6,964	2,800	4,747	7,507	393	2,990	346	1,736	927
1969	87,922	9,083	78,839	31,159	8,572	426	7,803	1,269	7,287	2,930	4,927	7,777	403	3,128	363	1,834	961
1970	90,186	9,180	81,006	31,593	9,052	433	7,985	1,330	7,537	3,052	5,080	8,025	412	3,238	388	1,883	998
1971	92,799	9,499	83,300	32,030	9,549	432	8,203	1,394	7,816	3,213	5,239	8,262	420	3,344	411	1,935	1,022

[1] Data were reported as rounded to tenths of millions.

Source: Column 1: 1950–55, 1960–66: "Trud v. SSSR," 1968, pp. 22 and 24–5. 1956–59: International Labour Office (ILO), "Year Book, 1966," p. 286. 1967: "Nar. khoz. 68," p. 548. 1968: "Nar. khoz. 69," p. 530. 1969: "Nar. khoz. 70," p. 510. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Column 2: 1950, 1955, 1960, 1965–69: Sovet, "Statisticheskiy," 1971, p. 385. 1952: "Nar. khoz. 62, p. 453. 1953: "Nar. khoz. 58," pp. 658–9. 1954: Sum of employment estimated for MTS/RTS (Weitzman and Elias, "Magnitude," 1961, p. 134) and estimates of employment for "sovkhozy and subsidiary agricultural enterprises" and "residual" derived by linear interpolation from figures reported for 1953 and 1955 in "Nar. khoz. 58," pp. 658–9. 1956–59, 1961–64: Old series figures reported in "Nar. khoz. 59," pp. 588–9; "Nar. khoz. 60," p. 636; and "Trud v. SSSR," 1968, pp. 24–5, less shifts to industry according to the 1958 reclassification. The latter figures were obtained by computing the differences between figures reported for both the old and new series for 1955, 1958–60, and 1965 in an unpublished ILO table; ILO, "Year Book, 1969," p. 311; "Trud v SSSR," 1968, p. 81; and Sovet, "Statisticheskiy," 1971, p. 385, and interpolating linearly to derive estimates for intervening years (see column 4, below). 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Column 3: Column 1 minus column 2.

Column 4: 1950, 1955, 1960, 1965–70: Sovet, "Statisticheskiy," 1971, p. 385. 1951–54: "Trud v SSSR," 1968, p. 81. 1956–57: Old series figures reported in ibid., p. 81, plus estimates of employment shifted from agriculture to industry according to the 1968 reclassification. The latter figures were obtained by computing the differences between figures reported for both the old and new series for 1955 and 1958 in an unpublished ILO table and Sovet, "Statisticheskiy," 1971, p. 385, and interpolating linearly to derive estimates for the intervening years. 1958: Unpublished ILO table. 1959: ILO "Year Book, 1969," p. 311. 1961–64: ILO, "Year Book, 1971," p. 328. Figures for mining and quarrying were added to the sum for the remaining branches to derive a total for industry. 1971: "Nar. khoz. 1922–72," pp. 346–7.

Column 5: 1950, 1955, 1960, 1965–69: Sovet, "Statisticheskiy," 1971, p. 385. 1951–54, 1956–59: Figures reported in "Trud v SSSR," 1968, p. 121, plus estimates of employment in construction-related activities shifted from "other" branches to construction according to the 1970 reclassification. The lattor figures were obtained by computing the differences between figures reported for both the old and new series for 1950, 1955, 1960, and 1965 in ibid.; Sovet, "Statisticheskiy," 1971, p. 385 and TsSU, "Kapital'noye," 1961, p. 268, and interpolating linearly to derive estimates for the intervening years. 1961–64: ILO, "Year Book, 1971," p. 328. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Columns 6, 8, 11, 12, 14, 15, 16: 1950, 1955, 1960, 1965–69: Sovet, Statisticheskiy, 1971, p. 385. 1952, 1959: "Nar. Khoz. 62," p. 453. 1953: "Nar. khoz. 58," pp. 658–9. 1956–58: "Nar. khoz. 59," pp. 588–9. 1961–64: "Trud v S.S.S.R.," 1968, pp. 24–5. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Columns 7 and 9: 1950, 1955, 1960–66: "Trud v SSSR," 1968, pp. 24–5. 1952–53: Figures reported in "Nar. khoz. 58," pp. 658–9, and "Nar. khoz. 62," p. 453, plus estimates for members of producers' cooperatives reclassified as state employees. The latter figures were obtained by computing the differences between the unadjusted figures for 1950 and 1955 reported in "Nar. khoz. 58," pp. 658–9 and adjusted figures for these years reported in Sovet, "Statisticheskiy," 1971, p. 385, and interpolating linearly to derive estimates for the intervening years. 1956–59: ILO, "Year Book, 1966," p. 287, less employment in communications (column 8). 1967–69: Sovet, "Statisticheskiy," 1971, p. 385. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Column 10: 1950, 1955, 1960–66: "Trud v SSSR.," 1968, pp. 24–5. 1952–53, 1956–59: Figures reported in "Nar. khoz. 58," pp. 658–9, and "Nar. khoz. 62," p. 453, plus estimates for members of producers' cooperatives derived in the manner described for columns 7 and 9. 1967–69: Sovet, "Statisticheskiy," 1971, p. 385. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Column 13: 1950, 1960, 1965, 1968–69: "Nar. khoz. 69," p. 530. 1955, 1966–67: "Nar. khoz. 60," p. 636, "Nar. khoz. 68," pp. 548–9, and Sovet, "Statisticheskiy," 1971, p. 385. 1961–64: Employment in 1960 moved by an index of "art" employment in the R.S.F.S.R. reported in annual statistical handbooks of that republic for 1961–64 and 1970. 1970–71: "Nar. khoz. 1922–72," pp. 346–7.

Column 17: 1950, 1960, 1965, 1969–70: "Nar. khoz. 70," p. 510. 1951–54, 1956–59, 1961–64, 1966–68: Derived as residuals. 1955: "Trud v SSSR," 1968, pp. 24–5, less employment in art and in construction-related activities (909,000); the latter figure was derived by subtracting construction employment reported in ibid., p. 121, from that reported in Sovet, "Statisticheskiy," 1971, p. 385 1971: "Nar. khoz. 1922–72," pp. 346–7.

The drop in the rate of increase noted above for all workers and employees also occurred in industry (table 9). Thus, the average annual rate of increase in industrial employment of 2.85 percent in 1966–70 represented a drop of one-third from the 4.39 percent in 1951–55 and a drop of one-quarter from the 3.94 percent achieved in 1961–65. The very sharp drop in the rate of increase during the 3 years, 1969–71 provides a signal indicator of the recent slowdown in industrial growth (and productivity) and is projected to continue throughout the entire period 1971–75, dropping further to 1.28 percent per year. Industry's share in the total number of workers and employees decreased from 37.9 percent in 1950 to 36.5 percent in 1960 and to 34.5 percent by 1971 (table 8). This share is to drop to 33.2 percent in 1975 according to the current plan directive.

The structure of employment by branch of industry is given for all (industrial-production) personnel and wageworkers in table 10, although data for both categories are not reported for all years and the scope and coverage also have changed several times precluding a consistent series. The fastest growing major branches between 1950 and 1971 were the electric power and the chemical and petrochemical industries, which increased by 251 and 241 percent, respectively. The largest branch, machine-building and metalworking, which contained 39 percent of all industrial-production personnel in 1971, increased by 187 percent between 1950 and 1971. The construction materials industry increased at a similar rate of 192 percent. The fuel industry had the lowest rate of growth, 22 percent, with the timber, woodworking, and pulp and paper group almost as low at 28 percent. Growth of employment in most branches slowed down during the latter half of the 1960's: the rate of growth in only two major branches, the construction materials and light industries, was faster during the years 1965–70 than during the years 1960–65.

TABLE 9.—INCREASE IN INDUSTRIAL EMPLOYMENT: 1950 TO 1971

Year	Number (thousands)		Percent	
	Annual total	Increase in 5-year period	Increase over previous year	Average annual increase
1950	15,317		(1)	
1951	16,230		5.96	
1952	16,873		3.96	
1953	17,617	3,667	4.41	4.39
1954	18,499		5.01	
1955	18,984		2.62	
1956	19,702		3.78	
1957	20,357		3.32	
1958	20,997	3,636	3.14	3.57
1959	21,670		3.21	
1960	22,620		4.38	
1961	23,817		5.29	
1962	24,677		3.61	
1963	25,442	4,827	3.10	3.94
1964	26,317		3.44	
1965	27,447		4.29	
1966	28,514		3.89	
1967	29,448		3.28	
1968	30,428	4,146	3.33	2.85
1969	31,159		2.40	
1970	31,593		1.39	
1971	32,030		1.38	

[1] Not applicable.

Source: Table 8.

The figures in table 10, however, are incomplete, and may be increasingly so. In April 1966, the Party and Government jointly decreed that the previously imposed restrictions on nonbasic farm activities should be abolished and industrial and other nonindustrial activities on collective and state farms expanded. It was hoped that this decree would at least slow down the outflow of labor from farms during seasonal periods of little agricultural activity. The newly increased industrial activities on the farms have resulted in a growth of output on collective and state farms and on intercollective farm organizations from 4.3 billion rubles in 1965 to 6.6 billion in 1968 (in constant 1967 prices). Collective farms alone produced 671.1 million rubles of marketed output (*tovarnaya produktsiya*) in 1966, 770 million in 1967, and 797 million in 1968. By 1968 there were 178,500 industrial-type units (enterprises, workshops, and installations) on collective farms, which employed an average of three permanent workers, for a total of 535,500 persons.[68] Those workers who are members of collective farms would not be included in the worker and employee figures for industrial employment given in table 10; hired workers (nonmembers) would be included.

TABLE 10.—INDUSTRIAL-PRODUCTION PERSONNEL AND WAGEWORKERS, BY BRANCH OF INDUSTRY: 1950 TO 1971

[Annual averages, in thousands]

Branch of industry	1950	1960	1965	1970	1971
Total:					
Industrial-production personnel	15,317	22,620	27,447	31,593	32,030
Wageworkers	12,226	18,887	22,576	25,631	26,097
Extraction, industrial-production personnel	(1)	3,597	3,631	3,597	3,570
Mining, industrial-production personnel	(1)	2,069	2,156	2,130	2,107
Manufacturing, industrial-production personnel	(1)	19,023	23,816	27,996	28,460
Electric power:					
Industrial-production personnel	184	397	540	633	645
Wageworkers	131	320	421	472	484
Fuel (including fuel products made from coal, oil, and shale):					
Industrial-production personnel	1,243	1,568	1,579	1,542	1,513
Wageworkers	1,042	1,338	1,323	1,285	(1)
Coal:					
Industrial-production personnel	858	1,196	1,200	1,120	1,090
Wageworkers	733	1,031	1,016	(1)	(1)
Ferrous metallurgy (including ore extraction):					
Industrial-production personnel	743	1,047	1,236	1,359	1,352
Wageworkers	605	886	1,037	1,133	(1)
Machine-building and metalworking:					
Industrial-production personnel	4,307	7,206	9,905	12,017	12,369
Wageworkers	3,343	5,787	7,797	9,275	(1)
Chemical and petrochemical:					
Industrial-production personnel	469	792	1,251	1,568	1,598
Wageworkers	355	648	1,017	1,264	(1)
Construction materials:					
Industrial-production personnel	699	1,575	1,716	1,996	2,039
Wageworkers	600	1,381	1,465	1,689	(1)
Timber, woodworking, and pulp and paper:					
Industrial-production personnel	2,208	2,698	2,819	2,848	2,829
Wageworkers	1,834	2,330	2,415	2,437	(1)
Woodworking, industrial-production personnel	(1)	1,151	1,311	1,341	1,343
Furniture, industrial-production personnel	(1)	336	429	462	483
Pulp and paper:					
Industrial-production personnel	140	173	212	259	260
Wageworkers	116	149	181	219	222
Glass and chinaware:					
Industrial-production personnel	176	213	247	262	272
Wageworkers	(1)	(1)	(1)	(1)	(1)
Glass (including medical glass), industrial-production personnel	(1)	164	189	203	208
Chinaware, industrial-production personnel	(1)	49	58	59	64

Footnote at end of table.

[68] Suslov, "Effectiveness," 1970, pp. 135–136, and Komissarov, "Rural," 1970, p. 3. For details on the number of organizations and types of products produced, by republic, in 1970, see *Sel'. khoz. SSSR*, 1971, pp. 572–575.

TABLE 10.—INDUSTRIAL-PRODUCTION PERSONNEL AND WAGEWORKERS, BY BRANCH OF INDUSTRY: 1950 TO 1971—Continued

[Annual averages, in thousands]

Branch of industry	1950	1960	1965	1970	1971
Light industry:					
Industrial-production personnel	2,653	3,860	4,308	5,019	5,036
Wageworkers	2,150	3,341	3,728	4,273	(1)
Textiles:					
Industrial-production personnel	1,399	1,814	1,953	2,113	2,109
Wageworkers	(1)	1,592	1,697	1,806	1,805
Garment:					
Industrial-production personnel	764	1,372	1,661	2,112	2,130
Wageworkers	(1)	1,174	1,436	1,798	1,817
Leather, fur, and shoe:					
Industrial-production personnel	463	601	622	708	710
Wageworkers	(1)	513	532	596	600
Shoes, industrial-production personnel	(1)	435	444	(1)	(1)
Food:					
Industrial-production personnel	1,693	2,164	2,592	2,961	2,903
Wageworkers	1,268	1,760	2,120	2,386	(1)
Meat and milk, industrial-production personnel	(1)	484	584	716	719
Breadbaking, industrial-production personnel	(1)	420	535	556	559
Alcohol, liquor, vodka, wine, beer, nonalcoholic drinks, industrial-production personnel	(1)	207	265	322	327
Tobacco-makhorka, industrial-production personnel	(1)	30	36	37	38
Flour milling and grain cracking, industrial-production personnel	(1)	137	133	142	140

[1] Not available.

Source:
"Industrial-production personnel," total and by branch of industry: 1950–65: "Nar. khoz. 1922–72," p. 147; Sovet, "Statisticheskiy," 1971, and 1972, p. 124; and "Vestnik statistiki," No. 4, April 1971, p. 87. 1970–71: "Vestnik statistiki," No. 11, November 1972, p. 93.
Wageworkers: Total—1950–71: "Nar. khoz. 1922–72," p. 147. By branch of industry—1950–70: Sovet "Statisticheskiy," 1972, pp. 125, 128–9; "Vestnik statistiki," No. 5, May 1972, p. 96; "Nar. khoz. 1970," p. 158; and "Nar. khoz. 1969," p. 165.

2. AGRICULTURE

Annual average employment in agriculture is estimated to have decreased from 43.0 million in 1950 to 37.3 million in 1971, a net reduction of about 13 percent in 20 years (table 14). This decline meant that agriculture no longer accounted for over half of all civilian employment; it amounted to 53 percent in 1950, 42 percent in 1960, and 31 percent in 1971. The branch was still by far the largest employer of all branches of the economy, however. (It is projected that in 1980 industry will employ more persons than agriculture.)

There was a significant shift in the sectoral structure of agricultural employment during these years. The number of workers and employees in the state sector increased from 3.4 million in 1950 to 9.5 million in 1971, thereby rising from 8 to 25 percent of the total employment in agriculture. During this same period collective farm employment fell by 40 percent, from 27.6 million in 1950 to 16.5 million in 1971, and declined from 64 to 44 percent of total agricultural employment. Employment in the private sector declined slightly, but as a proportion of total agricultural employment it rose from 28 to 30 percent. Changes in the structure of employment in socialized agriculture may be noted from table 11.

Despite the persistent high level of agricultural employment, labor shortages exist on many farms and the government has taken a number of actions in an apparently futile attempt to stem the out-migration, particularly of the young, from rural to urban areas. As indicated above, pension rights have been granted to collective farmers on a par with state workers, and restrictions on nonbasic farm ac-

tivities abolished. In January 1966, a guaranteed monthly wage was instituted, replacing the system under which all farm members shared the funds left after all other costs were met. The impact of this decree and comparisons with past average wages are seen from the following date (average monthly money wages plus value of in-kind payments, in rubles) : [69]

1940	12	1970			75
1950	17	1971	(plan)		77
1955	25	1972	(plan)		82
1960	28	1973	(plan)		88
1963	38	1974	(plan)		93
1967	63	1975	(plan)		98
1968	66				

By 1968, 97 percent of all collective farms were using the new wage system. The average daily payment to farm members in 1967 was 90 percent of average earnings on state farms; 2 years earlier it was only 70 percent.[70]

These measures seem not to have slowed down the flow of out-migrants. According to preliminary results of the 1970 census, "more than" 16 million persons left rural areas for the cities between January 1959 and January 1970. An average of 1.3 million persons reportedly left for urban areas each year of the 1959–65 period which increased to some 1.7 million per year during the subsequent 4 years. The 16–24 year olds comprise 60 percent of the out-migrants. As a consequence of this outflow, the share of those in the able-bodied ages in the remaining farm population has dropped sharply.[71] According to one estimate, the numbers of males and females in the age group 20–24 on collective farms have dropped by 38.0 and 43.5 percent, respectively, between 1964 and 1970. The 25–29 year old males dropped by 28.5 percent and females by 28.8 percent, and the 30–39 year old males declined by 4.2 percent and females by 15.6 percent.[72] Data for the R.S.F.S.R. indicate that 54 percent of the rural population in 1959 were in the able-bodied ages, but only 47 percent in 1967. Put another way, in 1959 there were 86 persons in the dependent ages (under 16 and over 59/64 years of age) for every 100 persons in the able-bodied ages; by 1967 this ratio had increased to 114. As a result, the average age of participants engaged in agricultural work in the R.S.F.S.R., and in a "number of [other] republics" reportedly has increased to about 50 years.[73] It is implied that a relatively large number of collective farmer families now do not include anyone in the able-bodied ages.

[69] Figures for 1940–68 are from Arutyunyan, *Sotsial'naya,* 1971, p. 114, and those for 1970–75 are from Gosplan, *Gosudarstvennyy,* 1972, p. 282. According to the plan fulfillment reports for 1971 and 1972, the implied actual monthly wages in these years were 77.1 and 80.7 rubles, respectively. *Pravda,* January 23, 1972, p. 1, and *Pravda,* January 30, 1973, p. 1.

[70] Bulavin. *Prevrashcheniye,* 1970. pp. 146, 148.

[71] Yevsyukov, "Migration," 1972, pp. 123–124; *Izvestiya,* April 19, 1970, p. 1; and Litvyakov, *Demograficheskiye,* 1969, p. 177.

[72] Zalevskiy, "More Fully," 1972, p. 68.

[73] Kasimovskiy, "Labor," 1972, p. 76, and Bulochnikova, "Rural," 1969, p. 73.

TABLE 11.—ANNUAL AVERAGE EMPLOYMENT IN SOCIALIZED AGRICULTURE: 1950 TO 1971

[In thousands; figures in parentheses were interpolated linearly]

Line No.	Item	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1	Total	31, 037	30, 498	29, 960	29, 626	31, 166	30, 841	31, 654	30, 928	30, 905	30, 068	29, 093
2	Nonagricultural work	3, 091	3, 114	3, 183	3, 147	3, 413	3, 263	3, 354	3, 305	3, 412	3, 423	3, 197
3	Agricultural work	27, 946	27, 384	26, 822	26, 479	27, 753	27, 578	28, 300	27, 623	27, 493	26, 645	25, 896
4	Workers and employees in State agriculture	3, 437	(3, 565)	3, 693	4, 026	5, 966	6, 041	5, 954	6, 628	6, 005	5, 568	6, 793
5	Nonagricultural work	431	473	515	543	761	563	587	572	612	623	597
6	Agricultural work	3, 006	3, 092	3, 178	3, 483	5, 205	5, 478	5, 367	6, 056	5, 393	4, 945	6, 196
7	State farms and subsidiary and other State agricultural enterprises—agricultural work	2, 425	(2, 467)	(2, 510)	2, 552	(2, 631)	2, 710	2, 784	3, 796	4, 456	4, 757	6, 022
8	Other organizations [1]—nonagricultural work	334	362	389	356	369	266	290	278	330	342	423
9	MTS's and RTS's	678	(736)	794	1, 118	2, 966	3, 065	2, 880	2, 554	1, 219	469	348
10	Nonagricultural work	97	111	126	187	392	297	297	294	282	281	174
11	Agricultural work	581	625	668	931	2, 574	2, 768	2, 583	2, 260	937	188	174
12	Collective farmers	27, 600	(26, 933)	(26, 267)	25, 600	(25, 200)	24, 800	25, 700	24, 300	24, 900	24, 500	22, 300
13	Nonagricultural work	2, 660	2, 641	2, 623	2, 604	2, 652	2, 700	2, 767	2, 733	2, 800	2, 800	2, 600
14	Agricultural work	24, 940	(24, 292)	(23, 644)	22, 996	(22, 548)	22, 100	22, 933	21, 567	22, 100	21, 700	19, 700

Line No.	Item	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1	Total	28,196	27,817	27,354	27,368	27,604	27,494	27,236	26,999	26,583	26,180	25,999
2	Nonagricultural work	2,836	2,648	2,544	2,260	2,155	2,187	2,631	2,779	2,589	2,481	2,414
3	Agricultural work	25,360	25,169	24,810	25,108	25,449	25,307	24,605	24,220	23,994	23,699	23,585
4	Workers and employees in State agriculture	7,496	7,817	7,954	8,168	8,704	8,894	8,836	8,899	9,083	9,180	9,499
5	Nonagricultural work	436	428	424	440	455	487	531	581	593	587	622
6	Agricultural work	7,060	7,389	7,530	7,728	8,249	8,407	8,305	8,318	8,490	8,593	8,877
7	State farms and subsidiary and other state agricultural enterprises—agricultural work	7,058	7,389	7,530	7,728	8,249	8,407	8,305	8,318	8,490	8,593	8,877
8	Other organizations [1]—nonagricultural work	435	428	424	440	455	487	531	581	593	587	622
9	MTS's and RTS's	3	0	0	0	0	0	0	0	0	0	0
10	Nonagricultural work	1	0	0	0	0	0	0	0	0	0	0
11	Agricultural work	2	0	0	0	0	0	0	0	0	0	0
12	Collective farmers	20,700	20,000	19,400	19,200	18,900	18,600	18,400	18,100	17,500	17,000	16,500
13	Nonagricultural work	2,400	2,220	2,120	1,820	1,700	1,700	2,100	2,198	1,996	1,894	1,792
14	Agricultural work	18,300	17,780	17,280	17,380	17,200	16,900	16,300	(15,902)	(15,504)	(15,106)	14,708

[1] Includes activities supporting agriculture, such as veterinary services; also includes hired personnel of collective farms, who numbered 196,000 in 1966.

Source:

Total—line (1) 1950–71: Sum of parts, line 4 plus line 12.

Nonagricultural work—line (2) 1950–71: Sum of parts, line 5 plus line 13.

Agricultural work—line (3) 1950–71: Sum of parts, line 6 plus line 14.

Workers and employees in state agriculture—line (4) 1950–71: Table 1, col. 2.

Nonagricultural work—line (5) 1950–71: Sum of parts, line 8 plus line 10.

Agricultural work—line (6) 1950–71: Sum of parts, line 7 plus line 11.

State farms and subsidiary and other state agricultural enterprises—agricultural work—line (7) 1950, 1960–70: "Sel'. khoz. SSSR," 1971, pp. 452–3. 1953, 1956–57: Line 4 minus line 9 and employment in "other organizations," as reported in Reed, "Estimates, 1967, p. 27. 1955, 1958–59: Estimated by multiplying the 1960 figure by an index derived from the old series for agricultural work, unrevised for the 1968 reclassification, as given in "Nar. khoz. 60," p. 521. 1971: "Nar. khoz. 1922–72," p. 346.

Other organizations—nonagricultural work—line (8) 1950–71: Line 4 minus the sum of lines 7 and 9.

MTS's and RTS's—line (9) 1950, 1953, 1955–57: "Nar. khoz. 58," pp. 658–9. 1952, 1958–61: Nar. khoz. 62, p. 453. 1954: Weitzman and Elias, "Magnitude," 1961, p. 134.

Nonagricultural work—line (10) 1950–61: Line 9 minus line 11.

Agricultural work—line (11) 1950, 1953, 1955–60: Line 9 multiplied by the ratios for corresponding years of employment in agricultural work to total MTS employment computed from data in "Sel'. khoz. SSSR," 1960, p. 450, and "Nar. khoz. 60," p. 521. 1951–52, 1954: Computed as for the years 1950, 1953, and 1955–60, above. Ratios were interpolated linearly. 1961: Computed as the same proportion of line 9 as in 1960.

Collective farmers—line (12) 1950, 1960–71: "Sel'. khoz. SSSR," 1971, p. 446, 1953, 1955, 1958–59: "Nar. khoz. 60, p. 521. 1956–57: "Sel'. khoz. SSSR," 1960, p. 450. 1971: "Nar. khoz. 1922–72," p. 283.

Nonagricultural work—line (13) 1950–71: Line 12 minus line 14.

Agricultural work—line (14) 1950, 1955, 1960–65: Figures reported in "Trud v SSSR," 1968, pp. 1924–5, reduced for each year by 1/6 of the number of attached workers reported for that year in "Sel'. khoz. SSSR," 1971 p. 446, and Trud v SSSR," 1968, pp. 124–5. The reduction factor of 1/6 represents the proportion of all attached workers counted as agricultural workers in 1966 (see ibid.). 1953, 1958–59: Figures reported in "Nar. khoz. 1960," p. 521, adjusted to exclude attached workers as above. 1956–57: Figures reported in "Sel'. khoz. SSSR," 1960, p. 450, plus the interpolated difference between totals for different series in 1955 and 1958 obtained from "Trud v SSSR," 1968, pp. 124–5, and "Nar. khoz. 1960," p. 521. The latter sources give a series with higher figures, thus requiring an upward adjustment of the old figures. The reason for the adjustment is not known. The resulting estimates were then adjusted to exclude attached workers, as above. 1967: Figure reported in "Nar. khoz. 67," p. 491, adjusted to exclude attached workers, as above. 1971: Obtained by a least squares linear regression expressing the trend of the size of collective farm agricultural employment during the period 1950–67.

The decline in the quality of the labor force on collective farms undoubtedly is one of the main reasons for the lack of success in significantly raising labor inputs in the socialized agricultural economy. As table 12 shows, there was a decrease of 5.8 million collective farmers during the period 1960–71, a drop of 26 percent. However, the total number of man-days worked decreased at a greater rate, 28 percent, and the average number of days worked per collective farmer dropped by 3 percent, after recovering from a lower average. Unless more intensive work per day can be extracted from the farmers actually participating, this situation combined with the deteriorating age structure of the farm population does not bode well for the major increases in labor productivity urgently desired by Soviet planners.

Each year, in an emergency-like situation, the party and government are obliged to issue a decree requiring the dispatching of workers from cities to farms to help with the harvest. In addition, students and military personnel help in the peak periods. One estimate has it that about 2.8 million urban residents are attached to the state and collective farms for agricultural work at its peak.[74] On an annual average basis, however, this number is reduced to about 600,000 persons assigned from enterprises and organizations, excluding students and military personnel. From about 500,000 persons during most of the 1960's, the number has been climbing lately and reached 700,000 in 1971 (table 13).

[74] Manevich, *Osnovnyye,* 1971, p. 128. In addition, approximately 600,000 trucks are mobilized from the cities to help bring in the harvest. "Machines," 1969, p. 1.

TABLE 12.—SELECTED MEASURES OF COLLECTIVE FARM EMPLOYMENT, 1960–71

Line No.	Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1	Annual average employment (thousands)	22,300	20,700	20,000	19,400	19,200	18,900	18,600	18,400	18,100	17,500	17,000	16,500
2	Man-days worked (millions)	5,286	4,908	4,725	4,531	4,493	4,278	4,197	4,127	4,063	3,891	3,851	3,797
3	Man-days worked per annual average collective farmer	237	237	236	234	234	226	226	224	224	[1] 222	227	230
4	Man-days worked per collective farmer in able-bodied ages	197	198	199	195	196	194	194	195	200	201	207	(2)

[1] Kostin, "Povysheniya," 1971, p. 172, cites 227 man-days per farmer in this year.
[2] Not available.

Source:
Line 1: Table 11.
Line 2:
1960–64, 1966–68: "Sel'. khoz. SSSR," 1971, p. 479. Derived from data on total payments for work and average amounts paid per man-day of work.
1965, 1969: Suslov, "Vosproizvodstvo," 1972, p. 81.
1970: "Sel'. khoz. SSSR," 1971, pp. 450–451.
1971: "Nar. khoz. 1922–72," p. 263. Derived in same manner as for 1960–64, 1966–68.
Line 3: Line 2 divided by line 1.
Line 4:
1960–63: Lapkes, "Tekhnicheskiy," 1968, p. 143.
1964, 1966: Sal'nikov, "Labor," 1968, p. 176.
1965: Churakov and Suvorova, "Ispol'zovaniye," 1967, p. 31.
1967: Yakimov, "Problemy," 1969, pp. 37–41.
1968: Mashenkov, "Problemy," 1971, p. 60.
1969–70: Sidorova, "Vozmeshcheniya," 1972, pp. 150 and 160.

TABLE 13.—*Annual average number of attached workers from other enterprises and organizations: 1950–1971*

[In thousands]

Year:	Number	Year—Continued	Number
1950	200	1965	500
1955	500	1966	500
1960	500	1967	500
1961	500	1968	500
1962	400	1969	600
1963	400	1970	600
1964	400	1971	700

NOTE.— In order to avoid double-counting on the aggregate, these persons, already on the registered rolls of other enterprises and organizations are not "counted" as part of the agricultural labor force, although they make an important contribution.

Source:
1950, 1960, 1965, 1970–71: *Nar. khoz. 1922–72*, p. 283.
1955; *Trud v SSSR*, 1968, p. 124.
1961–69: *Sel'. khoz. SSSR*, 1971, p. 446.

One of the principal deterrents to increasing participation in the socialized economy is the continuing deflection of farmers' labor into their private subsidiary agricultural activities. Before the wage reform and the abolishment of restrictions on subsidiary industry initiated in 1966, labor inputs into the private sector continually increased. Of the total labor expenditures on the socialized and private economies by all persons, 28.5 percent were spent on private work in 1958, 29.5 percent in 1960, 31.4 percent in 1963, and a significant jump to 35 percent in 1965, after the removal of restrictions imposed by Khrushchev. Able-bodied collective farmers spent 39 percent of their total working time in the private subsidiary economy in the 3 years 1964, 1965, and 1968.[75] The share of total output originating in the private sector fell from 37.2 percent in 1958 to 31.6 percent in 1965, and to 30.7 percent in 1967 (in constant 1965 prices).[76] Nonetheless, the sector still contributes nearly a third of total agricultural output. Similarly, although the share of total family income from the private subsidiary economy has decreased from 42.0 percent in 1958, to 38.3 percent in 1965, 34.6 percent in 1967, and 30.9 percent in 1969, it still amounts to about a third of the total (in the R.S.F.S.R.).[77] As indicated above, it is not only the young, the aged, and housewives who work in the private sector, but also those of able-bodied ages who have full-time jobs in the public sector. This latter input appears to have remained at about the same level over the recent past—farmers of able-bodied ages contribute two-thirds of the total labor input into the private sector, and four-fifths of this amount is expended by persons who also work on collective farms.[78]

3. OTHER BRANCHES

Among the nonagricultural branches other than industry, employment in science and the scientific services grew by 373 percent between 1950 and 1971, or more than two times the growth-rate of the entire state sector (table 8). Construction ranked next with an increase of 191 percent, rising from slightly over 8 percent to over 10 percent of total state employment. The two major services branches of health and

[75] Zalevskiy, "More Fully," 1972, p. 67; Mashenkov, *Effektivnost'*, 1969, p. 150; and Yakimov, *Problemy*, 1969, p. 88.
[76] Belyanov, *Lichnoye*, 1970, p. 53.
[77] Churakov, *Aktual'nyye*, 1972, p. 168.
[78] Mashenkov, *Effektivnost'*, 1969, p. 150, and ———, "Labor," 1965, p. 32. Also see Churakov, *Aktual'nyye*, 1972, p. 223.

education increased by 155 and 149 percent, respectively, followed by trade (133 percent) and the housing-communal economy and personal services (134 percent). Within the total trade group, retail trade and public dining grew at a high rate, and in recent years the wholesale trade component expanded rapidly as a result of explicit government policy. As noted above, employment in government administration declined by one-third during the 1960's, from 1.8 to 1.2 million, but has since gone back up to its 1950 level and beyond. Data from the recent handbook on labor show that centralization, as reflected by the high rates of growth of employment in the U.S.S.R. ministries and central institutions, has been proceeding rapidly; the rates were higher than those for any other category within the *apparat.* Employment in transportation has lagged, increasing by only 99 percent between 1950 and 1971—much less than the 130 percent registered by all workers and employees.

B. Current and Future Employment Trends

Estimates and projections of population and employment for the years 1950–80 are given in table 14. Figures for the years 1950–71 are either as reported in Soviet sources or estimates based on Soviet materials; employment figures for the years 1972–80 are projections based on Soviet plan goals for 1975, past trends, or assumptions derived from expectations of the growth of a sector or branch. The term "total employment" includes the regular armed forces as well as the annual average registered number of persons engaged in all other activities (called "civilian employment," although it should be understood that some unknown proportion of these persons are employed directly or indirectly in the production of military goods).

TABLE 14.—ESTIMATES AND PROJECTIONS OF POPULATION AND EMPLOYMENT: 1950 TO 1980

[In thousands. Population figures are as of July 1, civilian employment figures are annual averages]

Line No.	Item	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
	POPULATION																
1	Ages 16 years and over	122,160	124,283	126,802	129,987	133,598	137,048	140,144	142,807	144,628	145,486	146,129	147,101	148,536	150,419	152,711	155,286
2	Male	49,995	51,057	52,315	53,913	55,726	57,468	59,040	60,407	61,360	61,857	62,239	62,753	63,504	64,497	65,714	67,072
3	Female	72,165	73,226	74,487	76,074	77,872	79,580	81,104	82,400	83,268	83,629	83,890	84,348	85,032	85,922	86,997	88,214
4	Able-bodied ages (16–59/54)	103,345	104,848	106,708	109,184	112,033	114,658	116,873	118,639	119,574	119,606	119,459	119,622	120,233	121,245	122,586	124,142
	EMPLOYMENT																
5	Total	85,246	86,529	87,534	88,437	92,144	93,442	94,983	95,396	97,502	97,647	98,698	100,968	103,527	104,505	106,765	111,079
6	Armed forces	4,600	5,100	5,600	6,100	5,950	5,800	4,600	3,900	3,800	3,600	3,300	3,000	3,800	3,600	3,300	3,150
7	Civilian employment	80,646	81,429	81,934	82,337	86,194	87,642	90,383	91,496	93,702	94,047	95,398	97,968	99,727	100,905	103,465	107,929
8	Nonagricultural sectors	37,611	39,309	40,727	41,840	43,546	44,568	46,219	48,082	50,197	52,480	55,404	58,514	60,616	62,689	65,191	68,296
9	Industry	15,317	16,230	16,873	17,617	18,499	18,984	19,702	20,357	20,997	21,670	22,620	23,817	24,677	25,442	26,317	27,447
10	Other nonagricultural sectors	21,666	22,505	23,334	23,757	24,635	25,226	26,213	27,475	29,003	30,629	32,619	34,548	35,806	37,130	38,773	40,764
11	Services [1]	13,091	13,483	13,871	14,030	14,415	14,800	15,278	15,906	16,553	17,310	18,447	19,811	20,340	21,757	22,829	24,027
12	Other [2]	8,575	9,022	9,463	9,727	10,220	10,426	10,935	11,569	12,450	13,319	14,172	14,737	14,966	15,373	15,944	16,737
13	Independent artisans	628	574	520	466	412	358	304	250	197	181	165	149	133	117	101	85
14	Agricultural sectors	43,035	42,120	41,207	40,497	42,648	43,074	44,164	43,414	43,505	41,567	39,994	39,454	39,111	38,216	38,274	39,633
15	State	3,437	3,565	3,693	4,026	5,966	6,041	5,954	6,628	6,005	5,568	6,793	7,496	7,817	7,954	8,168	8,704
16	Collective farm	27,600	26,933	26,267	25,600	25,200	24,800	25,700	24,300	24,900	24,500	22,300	20,700	20,000	19,400	19,200	18,900
17	Private	11,998	11,622	11,247	10,871	11,482	12,233	12,510	12,486	12,600	11,499	10,901	11,258	11,294	10,862	10,906	12,029
18	Class of worker:																
19	Workers and employees	40,420	42,300	43,900	45,400	49,100	50,251	51,869	54,460	56,005	57,867	62,032	65,861	68,300	70,526	73,258	76,915
20	Collective farmers	27,600	26,933	26,267	25,600	25,200	24,800	25,700	24,300	24,900	24,500	22,300	20,700	20,000	19,400	19,200	18,900
21	Private agricultural sector	11,998	11,622	11,247	10,871	11,482	12,233	12,510	12,486	12,600	11,499	10,901	11,258	11,294	10,862	10,906	12,029
22	Independent artisans	628	574	520	466	412	358	304	250	197	181	165	149	133	117	101	85

Line No.	Item	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	POPULATION															
1	Ages 16 years and over	157,914	160,573	163,219	165,704	168,416	171,480	174,500	177,533	180,644	183,793	186,980	190,115	193,006	195,632	197,967
2	Male	68,429	69,818	71,251	72,623	74,082	75,688	77,265	78,854	80,486	82,143	83,826	85,489	87,034	88,448	89,718
3	Female	89,485	90,755	91,968	93,081	94,334	95,792	97,235	98,679	100,158	101,650	103,154	104,626	105,972	107,184	108,249
4	Able-bodied ages (16–59/54)	125,681	127,183	128,632	129,957	131,738	134,093	136,525	139,026	141,645	144,355	147,147	149,844	152,200	154,175	155,764

	EMPLOYMENT														
5	Total	113,834	115,856	118,073	119,900	121,870	123,943	126,119	127,926	129,735	131,543	133,501	135,459	137,419	139,377	141,335
6	Armed Forces	3,165	3,220	3,220	3,300	3,305	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375
7	Civilian employment	110,669	112,636	114,853	116,600	118,565	120,568	122,744	124,551	126,360	128,168	130,126	132,084	134,044	136,002	137,960
8	Nonagricultural sectors	70,884	73,491	76,238	78,861	81,012	83,300	85,531	87,454	89,377	91,300	93,614	95,928	98,243	100,557	102,871
9	Industry	28,514	29,448	30,428	31,159	31,593	32,030	32,414	32,829	33,245	33,660	34,098	34,535	34,973	35,410	35,848
10	Other nonagricultural sectors	42,301	43,990	45,773	47,680	49,413	51,270	53,117	54,625	56,132	57,640	59,516	61,393	63,270	65,147	67,023
11	Services [1]	25,052	26,183	27,483	28,649	29,615	30,670	32,065	33,248	34,432	35,615	36,773	37,932	39,090	40,249	41,407
12	Other [2]	17,249	17,807	18,290	19,031	19,798	20,600	21,052	21,377	21,700	22,025	22,743	23,461	24,180	24,898	25,616
13	Independent artisans	69	53	37	22	6	0	0	0	0	0	0	0	0	0	0
14	Agricultural sectors	39,785	39,145	38,615	37,739	37,553	37,268	37,213	37,097	36,983	36,868	36,512	36,156	35,801	35,445	35,089
15	State	8,894	8,836	8,899	9,083	9,180	9,499	9,669	9,779	9,890	10,000	10,148	10,296	10,445	10,593	10,741
16	Collective farm	18,600	18,400	18,100	17,500	17,000	16,500	16,325	16,150	15,975	15,800	15,403	15,006	14,608	14,211	13,814
17	Private	12,291	11,909	11,616	11,156	11,373	11,269	11,219	11,168	11,118	11,068	10,961	10,854	10,748	10,641	10,534
18	Class of worker:															
19	Workers and employees	79,709	82,274	85,100	87,922	90,186	92,799	95,200	97,233	99,267	101,300	103,762	106,224	108,688	111,150	113,612
20	Collective farmers	18,600	18,400	18,100	17,500	17,000	16,500	16,325	16,150	15,975	15,800	15,403	15,006	14,608	14,211	13,814
21	Private agricultural sector	12,291	11,909	11,616	11,156	11,373	11,269	11,219	11,168	11,118	11,068	10,961	10,854	10,748	10,641	10,534
22	Independent artisans	69	53	37	22	6	0	0	0	0	0	0	0	0	0	0

[1] Includes trade, public dining, material-technical supply and sales, and procurement; housing-communal economy and personal services; health services; education and culture; art; science and scientific services; credit and insurance organizations; and government administration; i.e., cols. 9 to 16 in table 8.

[2] Includes construction; forestry; transport; communications: and other; i.e., cols. 5 to 8 and 17 in table 8.

Note: Annual average civilian employment refers to the annual average registered number of persons (srednyaya spisochnaya chislennost' rabotnikov). For the state sector, it is derived as the average of 12 monthly averages which are, in turn, the averages of the daily numbers of persons listed on the rolls of the employing enterprise. A person appears on the rolls of his employing enterprise if he is paid by it; he remains on the rolls during excused absences from work, holidays, etc. For the collective farm sector, the annual average is derived as the average of 12 monthly numbers of participants.

Source and methodology: App. A.

The population aged 16 years and over, the total reservoir from which the workforce is drawn, will increase from 168.4 million in 1970 to 198.0 million in 1980, an increase of 29.6 million, or 17.6 percent. A slightly larger part of this increase (15.4 million) will occur by 1975. The population in the able-bodied ages will grow over the 10-year period slightly more rapidly than the total population aged 16 years and over, or by 18.2 percent.[79]

Civilian employment is expected to increase in the years 1970–75 by 9.6 million persons in all sectors, and by 9.9 million in the socialized sector alone; the socialized sector growth representing an increase of 9.2 percent. As seen in table 14, however, the growth projected for the 1970–75 period is a continuation of the decline in the absolute and relative growth of the number of persons employed in the socialized sector beginning in the 1960's and continuing to the end of the seventies. Thus, between 1960 and 1965, socialized sector employment grew by 11.5 million persons, then declined slightly to 11.4 million between 1965 and 1970. There is a more distinct decline to 9.9 million projected for the current period as indicated, and a slightly higher increase of 10.3 million during the last half of the decade. On a relative basis, however, the rate of decline in the growth of the socialized sector is much more pronounced since the base employment figure itself is larger. From 1960 to 1965, there was a 13.6 percent growth, from 1965 to 1970—11.9 percent, from 1970 to 1975—9.2 percent, and from 1975 to 1980—8.8 percent.

Changes in the patterns of growth by sector, branch, and class of worker are also provided in table 15. Projected rates of growth for the measures shown are generally lower in the latter part of the 1970's than they are for the present 5-year period, 1970 to 1975. Rates during the present period are in turn, with the singular exception of state agricultural employment, also lower than the preceding period. Even the rate of employment increase in services, while three times higher than in industry in the present period has dropped from 4.3 percent per year in 1965–70 to 3.8 percent in 1970–75.

TABLE 15.—GROWTH RATES OF SELECTED POPULATION AND MANPOWER MEASURES, 1950 TO 1980

[In percent per year]

Measure	1950–58	1958–65	1965–70	1970–75	1975–80
Population aged 16 years and over	2.1	1.0	1.6	1.8	1.5
Population of able-bodied ages	1.8	0.5	1.2	1.8	1.5
Total employment	1.7	1.9	1.9	1.5	1.4
Armed forces	−2.4	−2.6	1.0	0.4	0.0
Civilian employment	1.9	2.0	1.9	1.6	1.5
Socialized sector	2.2	2.4	2.2	1.8	1.7
Nonagricultural sectors	3.7	4.5	3.5	2.4	2.4
Industry	4.0	3.9	2.9	1.3	1.3
Services	3.0	5.5	4.3	3.8	3.1
Other	4.8	4.3	3.4	2.2	3.1
Agricultural sectors	0.2	−1.3	−1.1	−0.4	−1.0
State	7.2	5.4	1.1	1.7	1.4
Collective farm	−1.3	−3.9	−2.1	−1.5	−2.7
Private	0.6	−0.7	−1.1	−0.5	−1.0
Workers and employees	4.2	4.6	3.2	2.4	2.3
Collective farmers	−1.3	−3.9	−2.1	−1.5	−2.7

Source: Table 14. Rates for each period were calculated on the basis of data for the terminal year of the preceding period. Thus, the rates for 1965–70 are those for the preceding 5-year plan period and those for 1970–75 are for the present 5-year plan period.

[79] For more details, see the paper by Leedy in this volume.

The planned reduction in growth of industrial employment to slightly less than 1.3 percent per year (1.28 percent unrounded) in the years 1970–75, down by more than one-half the annual rate of 2.9 percent during the previous 5 years, and the very low anticipated growth of employment in construction could have a profound impact on the grandiose plans for the development of Siberia. Most of the labor for new construction sites and plants in the region would have to come from transfers of redundant labor or specific reassignment at the direction of the government, and given the patterns of out-migration and labor turnover described above, the task of maintaining adequate staffs in the outlying areas would be difficult indeed. In commenting on labor resources in the 1971–75 plan, M. G. Pervukhin, member of the Collegium of Gosplan U.S.S.R., said that "the problem will be resolved basically through mechanization and automation of production processes and the more effective use of cadres." Further, he noted that the increases in the number of workers and employees "will go mainly to new enterprises," and that workers will be attracted to the eastern regions through material stimulation as well as "faster rates of growth of housing and cultural and personal services organizations in these regions." Finally, Pervukhin stated that "a large number of industrial enterprises will be built during 1971–75 in small and middle-sized cities." [80] Except for the program regarding the supply of labor to new enterprises, the solutions to labor problems cited by Pervukhin are not new—and they have *not* been overwhelmingly successful in the past. Moreover, nothing was said about agricultural labor other than the necessity to "retain" young people in rural regions.

The reduction in the overall rate of growth of employment in industry, from 2.9 to 1.3 percent per year in the preceding and current 5-year plan periods, is reflected in the sharply reduced growth of employment projected for each branch of industry. Thus, instead of an actual aggregate growth for 5 years of 15.1 percent as in 1966–70, the 1971–75 plan calls for a growth of only 6.5 percent. This reduced rate of employment growth is reflected in the production and productivity plans for all branches of industry which, when taken together, imply no growth in employment in the electric power, oil extraction and refining industries, in ferrous and nonferrous metallurgy, and significantly less than 10 percent overall in the chemical, construction materials, light, and food industries.[81] The only branches that will grow by a significant amount, according to the Sonin and Miroshnichenko's estimates, are machine-building at a range of 10–30 percent and the gas industry at 20 percent. These projections of mostly slow or no growth, as dissimilar as they are to the past, have held true for the first year of the 5-year plan period. While separate 1971 employment data for gas or for machine-building alone are not available, for the entire complex of machine-building and metalworking the growth recorded in 1971 was 2.9 percent, or more than twice that for industrial-production personnel as a whole (table 10). Of the net growth of 437,000 industrial-production personnel in 1971, machine-building and metalworking alone accounted for 352,000, or 80.5 percent. At the same time, employment in the fuel industry as a whole, ferrous metallurgy, timber, woodworking and pulp and paper, and textile industries de-

[80] "Productive," 1971, p. 2.
[81] Sonin and Miroshnichenko, "On the Optimization," 1972, p. 260.

clined, and employment in the other branches for which data are available increased only nominally.

Agricultural employment was still at the high level (compared with other industrialized countries) of 37.3 million in 1971; it had dropped by 2.7 million in the last 11 years. Due to the growth of other branches during this period, agriculture's share of total employment decreased by 11 percentage points, from 41.9 to 30.9 percent; it is expected to decline proportionately less in the future, to 28.8 percent in 1975 and 25.4 percent in 1980. The detailed results of the 1970 population census can be expected to show that the agricultural labor force is overstocked with unskilled, older, female workers who are not a prime source for achieving significant gains in productivity (the greater use of fertilizers and improved seeds could contribute more to an increase in output with the given workforce). The mechanization of agricultural labor would require a younger, better trained labor force, with more males, to realize a significant effect. In sum, the agricultural sector holds little promise for either significant employment growth possibilities or for providing surplus labor, particularly in light of the recent agricultural output difficulties, and very low or negative labor productivity growth (see table 24).

C. Occupational Structure and Training

1. WAGEWORKERS

No information is as yet available on the educational attainment of the employed population by occupation from the 1970 census. The data in table 16, although now much out of date, provide one of the few pictures available of the educational levels reached by industrial wageworkers. Median levels cannot be computed from these data, but it is clear that great strides were made in the 30 years covered.

TABLE 16.—PERCENT DISTRIBUTION OF INDUSTRIAL WAGEWORKERS, BY LEVEL OF EDUCATION: 1929, 1952, AND 1959

Educational level completed	1929	1952	1959
All levels	100.0	100.0	100.0
Under 4th grade	50.5	21.9	14.0
4th to 7th grade	23.6	45.0	41.0
7th to 10th grade	7.4	29.0	34.6
Incomplete higher	(1)	(1)	8.0
Specialized secondary and higher	(1)	2.0	(1)
Illiterate	(1)	(1)	2.4
	18.5	2.1	(1)

[1] Entry represents zero or rounds to zero.

Source: 1929, 1959: Manevich, "Problemy," 1966, p. 61. 1952: Poletayev, "Robochiy," 1969, p. 163.

The pattern of change shown by these data is roughly corroborated by data from a sample of machine-building plants, probably in 1968, which give the average age of workers in various educational levels: Under 4th grade—the average age was 45 years; 4th to 7th grade—

34 years; 7th to 10th grade—about 35 years; and 10th grade—about 25 years.[82]

Data on the numbers of wageworkers in a selected group of generally more skilled occupations are given in table 17. These data, which are shown for both industry as a whole and machine-building and metalworking, are from censuses of occupations taken in various years during the period 1948–69. Between 1959 and 1969 the total number of industrial wageworkers counted in the occupational censuses increased by 39 percent, and by 64 percent in the machine-building and metalworking industry, but the number employed in the more highly skilled occupations shown increased much more rapidly. For example, the number of machinery operators rose by 143 percent during these years; gas and electric welders—123 percent; assemblers and fitters (*slesari*)—115 percent; electricians—113 percent; laboratory workers—112 percent; and machine adjusters and setters—99 percent. Among the occupations shown, those of fitter and machine-tool operator were held by the largest numbers of wageworkers, in both elements of industry and in all years.[83]

[82] Breyev, "On the Study," 1970, p. 118. According to the sociologist, N. Aitov, at present about 30 percent of the wageworkers in the machine-building industry have general secondary, incomplete higher, and higher education. For the chemical industry, the corresponding figure is 40–45 percent. See Aitov, "Step." 1971, p. 2. By 1980, he expects over half the workforce to have at least a general secondary education.

[83] Krevnevich, "Economic," 1968, p. 47.

TABLE 17.—WAGEWORKERS IN INDUSTRY AND IN THE MACHINE-BUILDING AND METALWORKING BRANCH, BY OCCUPATION, 1948 TO 1969

[In thousands. Figures refer to wageworkers in enterprises which have an independent balance]

Occupation	Industry				Machine-building and metalworking branch		
	May 1, 1948	Aug. 1, 1959	Aug. 2, 1965	Aug. 1, 1969	Aug. 1, 1959	Aug. 2, 1965	Aug. 1, 1969
Total	(1)	15,601	(1)	21,737	4,880	6,904	7,998
Of which:							
Adjusters and setters of automatic machines and machine tools	76	164	262	327	78	99	159
Machinery operators (apparatchik) and assistants	(1)	131	259	318	(1)	(1)	(1)
Assemblers and fitters of goods and parts (in machine-building)	(1)	190	310	408	190	310	408
Controllers, quality inspectors, sorters	209	552	759	897	246	337	421
Electrical fitters	(1)	207	247	306	(1)	(1)	(1)
Electricians	206	360	641	767	134	211	244
Fitters	710	1,614	2,366	2,783	924	1,411	1,662
Foundrymen, converter operators, and assistants	7	15	18	19	(1)	7	(1)
Freight handlers	259	499	598	604	(1)	157	(1)
Gas and electric welders	66	193	360	430	127	222	259
Laboratory workers	43	112	183	237	28	51	69
Machine-tool operators	505	1,097	1,390	1,562	924	1,162	1,373
Of which:							
Turners (tokari)	(1)	(1)	(1)	(1)	477	(1)	689
Automatic machine operators	10	18	26	31	(1)	23	(1)
Lathe operators (relievers)	(1)	(1)	(1)	(1)	(1)	3	(1)
Drilling machine operators	27	68	87	99	62	83	95
Planing machine operators	(1)	(1)	(1)	(1)	(1)	31	(1)
Planing-slotting machine operators	29	39	43	40	(1)	3	(1)
Polishing machine operators	(1)	(1)	(1)	(1)	(1)	31	(1)
Boring machine operators	6	21	38	47	(1)	36	(1)
Lathe operators (vertical boring machines)	(1)	(1)	(1)	(1)	(1)	14	(1)
Turret lathe operators	24	44	58	60	(1)	57	(1)
Lathe operators (excluding vertical boring and turret lathe operators)	278	530	651	714	(1)	(1)	(1)
Lathe operators for metals (excluding relievers and vertical boring and turret lathe operators)	(1)	(1)	(1)	(1)	(1)	516	(1)
Milling machine operators	59	145	200	237	129	185	218
Polishers and grinders	42	120	140	159	(1)	(1)	(1)
Polishers (shlifovschiki)	(1)	(1)	(1)	(1)	105	128	146
Mechanics, motormen, and assistants	290	935	1,243	1,345	138	197	228
Metal stamping machine operators	(1)	(1)	(1)	(1)	86	105	123
Miners (zaboyshchiki), loaders, roofing workers, headers	196	366	321	288	(1)	(1)	(1)
Painters, dyers, lacquers, decorators	(1)	118	162	187	(1)	124	(1)
Seamstresses, tailors	237	(1)	663	726	(1)	(1)	(1)
Weavers, spinners, rowers, twisters, ribbon lappers	182	313	348	351	(1)	(1)	(1)

[1] Not available.

Source: Shafranova, "Professional'nyy," 1972, p. 22; "Nar. khoz. 69," pp. 542–545; Shafranova "Several," 1970, p. 24; and "Trud v SSSR" 1968, pp. 198–209.

According to the Eighth Five-Year Plan, the number of all skilled wageworkers in the machine-building industry was to increase during the years 1966–70 by 35.1 percent, in the chemical industry by 68.0 percent, in ferrous metallurgy by 9.2 percent, in construction materials by 30.9 percent, in railroad transport by 14.5 percent, and in construction by 12.0 percent. In the coal industry the number was to decrease by 11.6 percent.[84] Despite the expansion of the vocational-technical school system during the 1960's, however, the supply of newly trained workers apparently still fell far short of demand in various branches of industry (table 18). Thus, in 1970 none of the branches shown could expect to be able to fill more than one-third of its vacant skilled worker positions with qualified graduates from vocational-technical schools. The timber, woodworking, and pulp and paper industry could expect to obtain 32 percent of its needs, but nonferrous metallurgy could hope for only 19 percent, machine-building 15 percent, and the construction materials industry only 8 percent. Much of the demand for skilled workers is met through on-the-job training and short-term courses. In addition, a certain portion of the vacant positions is filled by skilled workers who transfer from other branches.

A shortage of skilled workers was given as the specific cause for 225, or 20 percent, of the 1,148 new plants delayed in opening in the 4 years, 1964–67. According to surveys taken by TsSU, these shortages delayed the "mastering" of 50 out of 148 plants (20.3 percent) in 1964; 46 out of 411 (11.2 percent) in 1965; 79 out of 391 (20.2 percent) in 1966; and 50 out of 198 (25.3 percent) in 1967. In 1969, shortages of skilled workers limited attainment of planned levels of labor productivity to only 16 percent of newly opened coal mines, 18 percent of new ferrous metallurgical plants, 14 percent of new light industry plants, 6 percent of paper producing enterprises, etc.[85]

TABLE 18.—DEMAND FOR SKILLED WAGEWORKERS AND NUMBER OF GRADUATES OF VOCATIONAL-TECHNICAL SCHOOLS, BY BRANCH OF INDUSTRY: 1965 AND 1970

Branch of industry	1965			1970 (plan)		
	Demand for skilled wage-workers	Graduates of branch vocational-technical schools	Graduates as percent of demand	Demand for skilled wage-workers	Graduates of branch vocational-technical schools	Graduates as percent of demand
Machine-building	1,538,800	108,200	7.0	1,735,300	253,400	15.0
Chemical	90,200	21,000	23.0	183,000	36,000	20.0
Nonferrous metallurgy	106,000	13,000	13.0	99,200	18,900	19.0
Coal	120,700	17,600	15.0	83,500	21,200	25.0
Construction materials	100,600	2,600	2.6	123,600	9,200	7.5
Timber, wood-working, and pulp and paper	38,900	13,700	35.0	73,500	23,200	32.0
Light	512,000	30,800	6.0	577,000	65,600	11.0

Source: Novgorodskiy and Khaykin, "Podgotovka," 1968, p. 30. Percentages are given as cited in the source, and in most cases do not correspond to the absolute figures shown.

2. SPECIALISTS

The following discussion of specialists (employed persons with higher and specialized secondary education) centers around two factors: The structure and pattern of growth in the number of specialists,

[84] *Ibid.*, pp. 47–48.
[85] Zelenskiy and Voronin, "Labor," 1971, p. 31, and Notkin, *Faktory*, 1970, p. 123.

and their utilization on the job. The total number of persons with higher education employed in the civilian economy increased from 1.6 million at the beginning of 1951 to 6.9 million in 1971, an increase of 335 percent (table 19). This number is expected to grow to 9.3 million by the beginning of 1976, a further rise of 35.1 percent.[86] Reflecting the increased demand for trained personnel in the services sectors, the number of merchandising specialists grew more than 11 times in the two decades, although this category still represents less than 1 percent of the total number of persons with higher education employed in the national economy. Another category which grew rapidly—more than six times between 1951 and 1971—was that of economists and economic-statisticians; this category comprised 5 percent of the total at the beginning of 1951 and 7 percent in 1971. The number of persons in the two largest categories, engineers and teachers and related professionals, together comprised about 72 percent of the total at the beginning of 1971. The number of engineers is projected to grow between 1970 and 1975 by 1,350,000, or 58 percent more than in the preceding 5-year period.

TABLE 19.—GRADUATES OF HIGHER INSTITUTIONS EMPLOYED IN THE CIVILIAN ECONOMY, BY MAJOR FIELD OF STUDY: 1950 TO 1976

[In thousands, as of Jan. 1]

Year	Total	Engineers	Agronomists, zootechnicians, and veterinarians	Economists and economic-statisticians	Merchandising specialists	Lawyers	Physicians (excluding dentists)	Teachers, university graduates, and library, cultural, and informal education workers	Other
1950	1,442.8	400.2	101.7	72.8	4.7	25.1	232.4	556.7	49.2
1951	1,576.0	414.2	118.6	78.3	5.5	28.2	247.3	629.8	54.1
1955	2,184.0	597.8	146.8	105.2	8.6	47.1	229.0	906.4	73.1
1960	3,235.7	1,004.8	204.2	177.6	16.3	65.5	378.6	1,278.9	109.8
1965	4,547.6	1,497.5	285.8	273.4	29.9	81.4	480.4	1,736.8	162.4
1966	4,891.0	1,630.8	302.8	301.1	35.0	84.6	500.8	1,859.5	176.4
1967	5,226.9	1,789.0	323.1	333.2	39.5	88.3	519.0	1,956.1	178.7
1968	5,565.0	1,960.0	336.8	366.3	44.7	92.4	530.9	2,043.7	190.2
1969	6,042.0	2,168.0	360.0	410.0	51.0	99.0	558.0	2,190.0	206.0
1970	6,500.0	2,400.0	385.0	452.0	57.9	105.7	583.0	2,312.0	204.4
1971	6,852.6	2,486.5	408.4	492.5	64.3	105.9	602.7	2,462.3	230.0
1976	10,259.8	3,836.5	(1)	862.5	(1)	(1)	(1)	(1)	(1)

[1] Not available.

Source:

1950–69: Goodman, "Estimates," 1970, p. 27. The total figure for 1969 given here was reported in "Nar. khoz. 69" p. 549, and differs slightly from the total given in the source cited; the figure for "other" was changed accordingly.

1970: Series III data from Goodman, "Estimates," 1970, p. 29. Figures for "total" and "engineers" were reported in "Nar. khoz. 69", pp. 134, 549, and differ slightly from the figures given in the source cited; the figure for "other" was changed accordingly.

1971: TsSU, "Nar. obraz.," 1972, p. 235.

1976: The sum of the projected number of graduates during each of the years 1971–75 (Gosplan, "Gosudarstvennyy," 1972, p. 354)—3,407,200—was added to the reported total stock at the beginning of 1971. No provision was made for attrition due to retirement, death, entering the armed forces, etc. Engineers with higher education are to increase by 1,350,000 and economists by 370,000, according to Shuruyev and Ryabkov, "Higher," 1972, pp. 38–39.

[86] The current 5-year plan directives indicate that the projected number of specialists with both higher and specialized secondary education in 1975 is 23 million. However, this figure appears to be inconsistent with the TsSU stock figure of 16,840,000 at the end of 1970 plus the sum of the official projected annual graduations—8,858,200—which yields a total of almost 26 million by the end of the plan period, excluding any deduction for attrition. See TsSU, *Nar. obraz.*, 1972, p. 235; Gosplan, *Gosudarstvennyy*, 1972, p. 354; and Shuruyev and Ryabkov, "Higher," 1972, p. 38. The latter authors are on the staff of Gosplan U.S.S.R.

TABLE 20.—GRADUATES OF SPECIALIZED SECONDARY EDUCATIONAL INSTITUTIONS EMPLOYED IN THE CIVILIAN ECONOMY, BY MAJOR FIELD OF STUDY: 1950 TO 1976

[In thousands, as of Jan. 1]

Year	Total	Technicians	Agronomists, zootechnicians, veterinary feldshers, and veterinary technicians	Planners and statisticians	Merchandising specialists	Legal personnel	Medical workers (including dentists)	Teachers and library, cultural, and informal education workers	Other
1950	1,811.1	507.1	144.9	90.6	18.1	14.6	452.8	507.1	75.9
1951	2,035.0	569.8	162.8	101.7	20.4	16.4	508.7	569.8	81.4
1955	2,949.1	822.6	236.7	152.8	33.3	23.2	731.1	818.6	130.8
1960	4,781.1	1,703.1	337.1	299.6	88.0	18.1	1,119.7	1,018.4	197.1
1965	6,702.1	2,659.5	440.7	508.2	190.8	15.9	1,385.9	1,240.7	260.4
1966	7,174.9	2,886.7	465.0	571.0	219.2	16.4	1,453.6	1,282.3	280.7
1967	7,696.8	3,144.7	500.1	637.3	251.5	17.1	1,536.1	1,329.2	280.8
1968	8,290.0	3,467.3	523.1	710.3	287.8	18.1	1,609.1	1,367.5	306.8
1969	8,914.0	3,803.0	548.0	786.0	325.0	19.0	1,688.0	1,411.0	334.0
1970	9,600.0	4,117.7	589.8	844.9	349.4	18.5	1,820.1	1,509.2	350.4
1971	9,988.1	4,333.1	597.0	950.5	396.3	21.1	1,862.1	1,458.9	369.1
1976	15,439.1	6,983.1	(1)	(1)	(1)	(1)	(1)	(1)	(1)

[1] Not available.

Source:
1950–69: Goodman, "Estimates," 1970, p. 28. The total figure for 1969 given here was reported in "Nar. khoz. 69," p. 549, and differs slightly from the total given in the source cited; the figure for "other" was changed accordingly.
1970: Series II data from ibid., p. 30.
1971: TsSU, "Nar. obraz.," 1972, p. 235.
1976: The sum of the projected number of graduates during each of the years 1971–75 (Gosplan, "Gosudarstvennyy," 1972, p. 354)—5,451,000—was added to the reported stock at the beginning of 1971. No provision was made for attrition due to retirement, death, entering the armed forces, etc. The 2,650,000 increment to the number of technicians in the 9th 5-year plan period was estimated by substracting the reported increment of engineers (1,350,000, see table 19), from the projected combined total increment of 4,000,000 for engineers and technicians, given in Gosplan, "Gosudarstvennyy," 1972, p. 314.

The growth in the number of specialists with specialized secondary education (table 20) shows that the merchandising specialists as well as planners and statisticians grew at a relatively fast rate during the past two decades. Technicians, the largest category of specialists at this level, increased by 660 percent in the period 1951–1971. The official policy to increase the number of technicians in the production branches (industry, construction, transport, communications, and agriculture) relative to the number of engineers [87] has resulted in a slight increase in the aggregate ratio of technicians to engineers, from 1.38 at the beginning of 1951 to 1.74 in 1971. According to the projections given in tables 19 and 20, this ratio will reach 1.82 by the beginning of 1976. The slowdown in the rate of increase of the ratio reflects the lower ratio of graduates from specialized secondary educational institutions to those of higher schools in the period 1971–75 of 1.60, which is lower than the 1.70 recorded in the years 1966–70 (but higher than the 1.48 in the preceding 5 years).[88]

Numerous reports of shortages and of under- or malutilization of specialists have been published. According to V. Komarov, a leading Soviet analyst of the utilization of specialists, the situation about which he wrote in 1969 also is described in a monograph published in 1972, indicating that the same conditions prevailed. Thus, he states that only 34 percent of all engineering positions in industry at the end of 1966 were filled with specialists having a higher degree. Persons with

[87] See Feshbach, "Manpower," 1966, pp. 736–737.
[88] Derived from graduate data in Gosplan, *Gosudarstvennyy*, 1972, p. 354, and TsSU, *Nar. obraz.*, 1972, p. 190.

a specialized secondary education filled 43 percent of the positions, and *praktiki* (experienced persons without formal school training as a specialist) filled 23 percent.[89] This "shortage" also is reflected in Komarov's report that there were 3,087,000 engineering-technical and managerial positions in industry in 1966, but only 2,747,000 persons with higher and specialized secondary education employed in that branch; at the end of 1968, the comparable figures showed some worsening with 3,520,000 positions and 3,094,000 specialists employed.[90] Actually, however, it is not possible to be precise about a "shortage" using these data because the numbers of specialists employed include all persons with higher and specialized secondary school diplomas rather than only engineering and technician graduates. According to data for 1970 (as of November 16), only 78 percent of all specialists employed in industrial enterprises were engineers and technicians with diplomas in these fields.[91] Assuming that this proportion is applicable to both 1966 and 1969, then the number of engineers and technicians in these years would be 2,142,660 in 1966 and 2,413,330 in 1968. Dividing these numbers by the number of positions for engineers, technicians, and managers in each year reveals that in 1966 and 1968, only 69.4 and 68.6 percent, respectively, of the positions were filled by engineers and technicians; these rates are considerably lower than the proportions of all specialists employed relative to the number of positions (89.0 percent in 1966 and 87.9 percent in 1968).

Figures for the number of specialists as a ratio of the number of positions, by branch of industry, at the end of 1968 show a wide range from a low of 53.2 percent in the timber, woodworking and pulp and paper industry to an overfulfillment in the ferrous metallurgical (120.9 percent) and chemical and petrochemical industries (147.3 percent). The machine-building and metalworking industry, however, had only about four-fifths of its engineering-technical and managerial positions filled by persons with diplomas in all fields (1,383,000 of 1,744,300).[92]

A complicating factor in evaluating the actual supply-demand situation of specialists in industry is that some 300,000 were employed in wageworker positions.[93] A special survey of 240 industrial enterprises which employed 115,000 specialists was conducted by TsSU as of April 15, 1968, and the results provide some detail on the use of more highly educated persons as wageworkers. Some 2 percent of the number in the survey with higher education, and 23 percent of the number in the survey with specialized secondary education were classified as wageworkers. In the machine-building industry enterprises surveyed, the comparable figures were 2 and 15 percent of the two groups, respectively. In the textile, chemical, and ferrous metallurgical industry plants, the proportions of specialized secondary school graduates working as wageworkers were 38, 32, and 33 percent, respectively.[94] There were numerous reasons for such malutilization. The primary one was that there were no vacancies in their specific specialties for approximately one-third of the graduates (31 percent of the higher and 38 per-

[89] Komarov, *Ekonomicheskiye*, 1972, p. 172, and ——, "Questions," 1969, p. 18. Also see Ivanova and Samarina, *Tekhnicheskiy*, 1970, p. 60.
[90] Komarov, *Ekonomicheskiye*, 1972, p. 171, and ——, "Questions," 1969, p. 18.
[91] See TsSU, *Nar. obraz.*, 1972, pp. 237–239.
[92] Komarov, *Ekonomicheskiye*, 1972, p. 172. For more details on extensive malutilization in Uzbekistan, also see Bolotov, "On the Rational," 1972, pp. 25–27.
[93] Stepanyan, *Klassy*, 1968, p. 189. In the survey of December 1, 1963, there were 7,200 wageworkers with higher education and 234,700 with secondary-technical education, or 1.2 percent of all industrial wageworkers. Kim, *Sovetskaya*, 1968, p. 418.
[94] Ivanova and Samarina, *Tekhnicheskiy*, 1970, p. 62.

cent of the specialized secondary school graduates). Another 20 percent of the higher and 9 percent of the secondary school graduates were assigned to occupations in which the duties did not correspond to the "profile" of their training. Economic reasons also played a part. Some 12 percent of the group with higher education and 21 percent with specialized secondary education did not attempt to find jobs in their specialties because such jobs called for lower wages than those they actually earned.[95] Other information from the Ukraine indicates similar proportions as to reasons for malutilization. At the end of 1968, over 6,000 higher school graduates and 80,000 specialized secondary graduates were working as wageworkers in Ukrainian industrial enterprises. Of these 86,000, 47.7 percent were working as wageworkers due to the lack of appropriate vacancies, and 12.3 percent stated that they were receiving higher wages in their present jobs than they could earn by working in their specialties elsewhere. The latter reason was particularly strong among technicians.[96]

One of the underlying reasons for the malutilization of specialists undoubtedly lies in the extremely narrow range of specialties offered in the schools. In spite of the growing undersupply of specialists in the Ministry of Coal Industry, there were persons with the specific specialty of "Automation and Complex Mechanization of the Mining Industry" who could not find jobs in their field. Instead they were used in automatic machine assembly and setting.[97] In July 1972, 9 years after the first official recognition of the problem of too narrow training offered in higher educational institutions, another decree passed by the Central Committee of the Communist Party and Council of Ministers U.S.S.R. was published on improvement of the higher education system, including the obligation of the Ministry of Higher and Specialized Secondary Education, with the agreement of Gosplan U.S.S.R. and interested ministries and agencies, to review the training profiles (fields) offered, and to "pay special attention to the training of specialists with a wide profile.[98]

Another underlying reason for the malutilization of specialists is the poor quality of work done in preparing educational plans and staffing tables. The goal set in May 1963 was to achieve a structure of employment of 3 to 4 technicians for every engineer in the production branches by 1970; the demands stemming from the staffing tables, however, were the exact reverse. In a 1966 survey, TsSU found that for every engineer position there was on the average only three-tenths of a position for a technician. The ratios reported in the survey ranged from 26 engineers for each technician at the Kalinin Excavator Plant to 0.4 at the Krasnodarsk Oil Refining Plant.[99] New staffing tables were prepared by the industrial ministries in 1966–67, but they still called for large numbers of engineers relative to technicians. In the preparation of these tables, enterprise managers reportedly attempted to get larger wage funds by requesting more engineers.[100] Another indication that staffing tables call for relatively high numbers of engineers in the Soviet Union is suggested by several comparisons of Soviet and U.S. practice. One such study indicated that the machine-building

[95] *Ibid*, p. 63.
[96] Rudoy, "Several," 1969, p. 81.
[97] Lovtsova, "Several," 1971, pp. 67–68.
[98] See "On Measures for Further Improvement of Higher," 1972, p. 1.
[99] Ivanova and Samarina, *Tekhnicheskiy*, 1970, p. 59.
[100] Komarov, "Questions," 1969, p. 20.

industry in the U.S.S.R. had a ratio of 30 wageworkers per engineer whereas in the United States it was 40. Similarly, Soviet estimates indicate that for each billion rubles of output Soviet industrial plants require 4,300 engineers, whereas for a similar level of output U.S. plants require only 1,200.[101]

Reported shortages of specialists in specific fields seem to have received prompt attention, even if insufficient to meet total demand. Thus, in 1958 the planned need for mathematicians and computing-instrument specialists was met by only 36.5 percent. Within a short time, however, the pattern of admissions to higher schools for these and related fields expanded sharply as priorities were established. Admissions increased by 41 percent in the machine-building and instrument-building specialty between 1958 and 1959, by 95 percent in radiotechniques and communications, and by 110 percent in electrical machine-building and electrical instrument-making. By 1960, admissions to the field of automation and telemechanics, as well as to electronic instrument-making, were 1.8 times as large as in 1958, those in diaclectrics and semiconductors were 2.3 times as large, and those in mathematical and computing instruments and in radiotechniques were 2.5 times as large.[102] Graduation data appear to confirm success in this massive growth.

There are real and continuing shortages elsewhere, however, particularly in the services branches. One of the major problems in meeting the plan goals in this sector is the low prestige and pay as an employee in services enterprises. Many survey respondents have noted their opinion that household and municipal services are insignificant and mediocre.[103] The 1967 plan for enrollment in Moscow vocational-technical schools for trade was fulfilled by only 22 percent, and in Leningrad by only 47 percent.[104] Schools and the media are frequently denounced for not instilling the proper attitude toward work in these jobs.

As noted above, competition must generally be fierce for entry to higher schools, and particularly for admission to the more desirable fields. The situation is spotty, however, and there are difficulties in meeting admissions plans for certain specialties. This is especially true of enrollment in pedagogical institutes. According to one report, enrollment plans are met in part on the basis of a significant number of persons who enroll in higher pedagogical schools "simply out of the desire to obtain a higher education," and without any intention of working as teachers.[105] The acute shortage of teachers in rural areas has continued for a number of years, and despite the smaller cohorts of pupils now entering the lower schools it promises to continue. Like most other persons, teachers do not report to or remain in the villages; if they do report to their place of assignment they move to the cities as soon as they can, leaving vacancies behind them. In Belorussia, for example, only three-fourths of the 5,958 new graduates assigned to schools and child-care institutions throughout the republic actually showed up for work, the rural situation apparently being much worse than in the cities. The personnel director of the Belorussian Ministry of Education, in describing the ministry's difficulties further indi-

[101] Kotkovskiy, "Status," 1969, p. 10.
[102] Kim, *Sovetskaya*, 1968, p. 321, 398.
[103] Shakhov, "Everyday," 1968, p. 2.
[104] Voronin, "On the Threshold," 1967, p. 2.
[105] Filippov, "First," 1968, p. 2.

cated that many found jobs elsewhere without any difficulty because plant managers would hire them even if they did not have the appropriate documents.[106] Another factor contributing to the shortage of teachers in the villages is that most higher school graduates come from urban areas because graduates of rural secondary schools cannot compete academically with their urban counterparts for admission to higher schools.[107]

D. Regional Distribution

1. CHANGING STRUCTURE

In addition to the regional population factor in the supply of labor as described above, the territorial distribution and stability of employment plays an important role in the realization of production and investment plans, and Soviet officials have long wrestled with the problems involved in maintaining control over redistribution—for strategic as well as for economic purposes. Systematic data for the oblast or economic region levels are not available, and it is necessary to discuss the distribution of employment (in the state sector) at the more aggregate, republican level. Table 21 reveals that between 1950 and 1971 employment grew fastest in the two small republics of Moldavia and Armenia (4.1 and 3.7 times the levels in 1950, respectively), although the rates of growth in Lithuania, Kazakhstan, Tadzhikistan, and Kirgiziya were only slightly lower. Total employment in each of the republics more than doubled, as did the national total. The R.S.F.S.R. and Ukraine together accounted for more than three-quarters of all state-sector employment in the years shown, although the proportion declined somewhat, from 83.4 percent in 1950 to 78.1 percent in 1971. Industrial employment was also concentrated heavily in these two republics, 87.1 percent of the total in 1950 and 82.9 percent in 1971. As expected from the intense development of state farming in the Kazakh S.S.R., that republic had the highest proportion of employment in state farms and subsidiary state agricultural organizations in all 4 years shown and more than double the level registered for the U.S.S.R. as a whole.

[106] Mostkov, "They," 1971, p. 3. The Ukrainian Ministry of Education personnel director tells the same story about the hiring of young teachers without documents at the first enterprise they try. See Rovna, "A Temporary," 1972, p. 4.

[107] Yemel'yanov, "Road," 1968, p. 3.

TABLE 21.—WORKERS AND EMPLOYEES, BY BRANCH OF THE ECONOMY AND REPUBLIC: 1950, 1960, 1970, AND 1971

[Annual average figures in thousands]

Branch of the economy	U.S.S.R., total	R.S.F.S.R.	Ukrainian S.S.R.	Belo-Russian S.S.R.	Uzbek S.S.R.	Kazakh S.S.R.	Georgian S.S.R.	Azer-baydzhan S.S.R.	Lithuanian S.S.R.	Moldavian S.S.R.	Latvian S.S.R.	Kirgiz S.S.R.	Tadzhik S.S.R.	Arme-nian S.S.R.	Turk-men S.S.R.	Estonian S.S.R.
Total:																
1950	40,420	26,749	6,943	1,038	889	1,388	629	571	339	253	452	247	178	237	217	290
1960	62,032	39,505	10,659	1,887	1,565	2,942	940	748	674	439	725	434	320	427	314	453
1970	90,186	54,376	16,200	3,075	2,642	4,692	1,490	1,273	1,166	944	1,033	780	586	838	478	613
1971	92,799	55,770	16,692	3,190	2,744	4,837	1,546	1,304	1,198	1,034	1,053	816	620	870	498	627
Industry (industrial-production personnel)																
1950	15,317	10,827	2,509	346	254	365	175	173	97	52	171	66	44	81	51	106
1960	22,291	15,139	4,028	553	366	561	270	219	210	122	272	107	74	142	67	161
1970	31,593	20,206	6,036	1,030	579	1,052	385	308	415	260	397	204	131	273	91	226
1971	32,030	20,403	6,143	1,070	598	1,075	388	309	424	272	400	212	134	282	93	227
Construction:																
1950	2,603	1,662	502	54	39	104	61	53	13	12	23	12	8	22	20	18
1960	5,143	3,137	891	128	143	332	91	68	59	43	57	39	39	46	40	30
1970	9,052	5,227	1,658	306	326	530	156	139	129	99	88	80	74	101	79	60
1971	9,549	5,537	1,744	324	341	555	166	142	133	104	92	83	78	106	82	62
Agriculture:																
1950	3,437	2,134	611	66	121	219	38	32	34	32	30	43	20	14	18	25
1960	7,123	4,170	969	381	329	706	70	45	101	40	79	76	31	37	28	61
1970	9,180	5,081	1,183	439	414	968	194	185	132	127	91	116	68	95	31	56
1971	9,499	5,262	1,207	443	421	983	207	187	131	177	94	123	78	96	32	58
Of which, state farms and subsidiary state agricultural enterprises:																
1950	2,425	1,490	446	36	89	167	29	20	24	23	20	31	13	8	11	18
1960	6,324	3,751	815	347	295	658	58	28	85	32	69	63	24	31	20	48
1970	8,593	4,808	1,070	412	371	942	178	167	122	121	79	104	58	85	23	48
1971	8,877	4,975	1,083	413	383	953	189	168	120	170	81	111	69	87	24	51
Forestry:																
1950	444	274	80	26	6	9	9	3	9	3	11	2	1	3	1	7
1960	359	211	70	21	3	14	8	3	9	3	4	3	1	3	1	6
1970	433	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
1971	432	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Transport:																
1950	4,117	2,691	710	122	74	182	55	65	37	28	51	14	13	15	29	31
1960	6,279	4,004	1,062	171	123	385	95	84	59	43	74	35	28	34	38	44
1970	7,985	4,725	1,502	249	218	477	135	120	93	84	93	67	54	56	57	55
1971	8,203	4,838	1,551	258	231	490	138	124	95	87	94	69	58	56	60	56
Communications:																
1950	542	349	87	19	10	20	8	8	7	5	10	3	3	3	4	6
1960	738	471	113	27	17	34	11	10	10	6	11	5	5	5	5	8
1970	1,330	793	241	48	34	73	23	20	17	14	17	12	9	11	8	10
1971	1,394	827	256	50	35	76	24	21	19	15	17	13	10	12	9	10

Trade, material-technical supply and sales, and public dining:																
1950	3,360	2,132	613	90	104	115	56	50	31	28	36	23	19	18	22	23
1960	4,675	2,868	854	137	138	240	78	62	49	40	54	37	28	28	29	33
1970	7,537	4,407	1,465	250	249	384	121	102	95	92	92	67	51	60	48	54
1971	7,816	4,557	1,526	258	259	398	126	106	101	95	95	71	54	64	50	56
Housing-communal economy and personal services:																
1950	1,371	950	222	23	21	37	24	20	12	5	22	4	4	8	5	14
1960	1,920	1,277	315	38	33	73	38	28	18	12	29	10	8	14	9	18
1970	3,052	1,905	540	69	82	138	63	47	37	22	43	19	18	29	17	23
1971	3,213	1,990	575	74	85	149	68	51	39	25	44	20	19	31	18	25
Health services:																
1950	2,051	1,261	385	63	60	64	51	39	17	21	23	13	12	14	15	13
1960	3,461	2,026	689	106	109	146	77	59	41	39	45	27	22	24	26	25
1970	5,080	2,877	1,014	172	181	257	113	89	62	60	56	51	39	40	37	32
1971	5,239	2,960	1,044	179	190	268	115	91	65	62	56	53	42	42	39	33
Education and culture:																
1950	3,315	1,958	617	124	109	120	87	58	38	35	34	30	27	34	23	21
1960	4,803	2,782	881	183	175	211	116	85	62	56	50	44	46	48	33	31
1970	8,025	4,461	1,422	291	371	474	172	157	100	115	79	90	88	95	65	45
1971	8,262	4,556	1,464	301	391	498	182	163	103	120	81	95	93	100	68	47
Science:																
1950	714	531	71	6	15	35	13	10	3	2	4	10	5	4	3	2
1960	1,763	1,266	199	31	37	84	25	22	12	8	11	21	13	16	10	8
1970	3,238	2,295	425	61	63	123	48	37	29	21	25	29	18	33	15	16
1971	3,374	2,384	448	68	64	124	50	39	31	23	27	30	18	35	15	18
Credit and insurance organizations:																
1950	264	160	46	9	7	11	5	4	4	3	4	3	2	2	2	2
1960	265	162	46	8	8	12	5	4	4	2	3	3	2	2	2	2
1970	388	237	68	12	11	21	6	5	5	4	4	4	3	3	2	3
1971	411	249	73	13	12	22	7	5	5	4	5	4	3	3	3	3
Administrative organs of state, economic, cooperative, and social organizations:																
1950	1,831	1,103	333	67	47	73	29	25	28	20	24	19	15	13	15	15
1960	1,245	744	216	43	38	61	24	21	14	12	14	12	11	11	11	10
1970	1,883	1,087	337	74	65	96	34	32	27	24	24	19	17	18	15	14
1971	1,935	1,114	344	77	67	100	36	33	27	26	25	20	17	19	16	14
Other:[2]																
1950	1,054	712	157	23	22	34	18	31	9	7	9	5	5	6	9	7
1960	1,967	1,248	326	60	46	83	32	39	23	13	22	15	12	17	15	16
1970	1,410	1,075	309	74	49	99	40	32	25	22	24	22	16	24	13	19
1971	1,442	1,093	317	75	50	99	39	33	25	24	23	23	16	24	13	18

[1] Not available.
[2] For the U.S.S.R., "Other" includes art as well as the residual category "Other"; for the republics, it also includes forestry.

Source: 1950, 1960: Trud v SSSR, pp. 24–25, 42–71. Figures for industry, agriculture, and construction are reported according to the classification system in use prior to 1967; they differ from figures for those branches given in table 8, which are reported according to the classification system adopted in 1967; 1970–71: Nar. khoz. 1922–72, pp. 510–687.

2. EMPLOYMENT IN SMALLER CITIES

A fairly recent addition to the public discussion of the problems connected with the regional deployment of manpower is that concerning the lack of employment opportunities in small and medium-sized cities. The population of these cities, of up to 100,000 persons each, constituted 44.4 percent of the urban population of the U.S.S.R. in January 1970.[108] This problem came to the attention of the authorities in the early 1960's as they began a search for new sources of labor supply. In 1965, TsSU conducted a survey in 416 small urban places to determine the number of persons who were not working and the conditions attached to their entry into the labor force. It was found that 45 percent of these persons (overwhelmingly female) would leave their households for outside employment, but only if certain criteria were met. These criteria included the provision of child-care facilities (stipulated by 36 percent of those who thought they would accept work), employment near place of residence (19 percent), and the offer of work in their field of training or specialty (12 percent).[109] Gosplan keeps a current list of such cities for use in its planning. The list included 529 small and medium-sized cities for the Eighth Five-Year Plan, and over 500 for the current plan.[110]

A number of considerations are involved in deciding whether and where to invest resources for developing job opportunities in these areas. According to TsSU R.S.F.S.R., about 50 percent of the total industrial output in that republic is produced in 71 cities; the other 50 percent is produced in 892 cities and 1,841 urban settlements. Thus, there are many candidates for investment funds. Further, in most of these latter cities the nonworking population is predominantly female, while the existing industries employ mainly men—due in part to tradition and in part to an official restriction against hiring women for hot, heavy, and hazardous occupations. It was decided, therefore, to construct light industry plants (whose workforce is on the average three-quarters female) in the smaller cities, but in many cases plans designed for large-scale plants were used, with a resultant requirement for more employees than could be locally found or maintained. It then became necessary to "import" labor from other regions of the country, most of which subsequently left. In addition, the infrastructure of many small cities is unable to provide the services and transportation essential for a large expansion of employment. One remedy for this situation has been found in a program adopted by some of the larger plants in Moscow and Leningrad, both of which are suffering from severe labor shortages. These plants are establishing branch units (*filiali*) in small, nearby cities. The migration specialist, V. Perevedentsev, nevertheless, argues strongly against the investments advocated for smaller

[108] *Nar. khoz. 69*, p. 29.
[109] *Trud*, April 4, 1967, p. 2.
[110] Kostin, *Povysheniye*, 1972, p. 169, and Zelenskiy and Voronin, "Working," April 11, 1972, p. 2.

cities, and calculates that the output per worker in larger cities is much higher, as is the output/capital ratio.[111]

Soviet planners also hope that success in these programs will lead to the elimination of predominantly "male" or "female" cities. The existence of a significant imbalance of the sexes in numerous cities has led to a large amount of labor turnover and migration as young people seek cities with a more equal balance. In cities with primarily female populations the illegitimacy and divorce rates are relatively high and the birthrate low. Also, juvenile delinquency reportedly rises along with the proportion of children without fathers.[112]

In 1967 the economist, Ya. Kvasha, argued that a form of producers' cooperative should be reinstituted (the former system was abolished in 1960).[113] At the same time, the Minister of Local Industry R.S.F.S.R., I. Marchenko, argued for the establishment of a small handicrafts industry among the rural population.[114] Subsidiary industry has since been developed on the collective farms, although it is oriented primarily toward the production of nonhandicraft-type products such as bricks or canned goods. Six years later the government has still not adopted a policy to set up new producers' cooperatives. The reality of the situation regarding official policy toward the dispersion of industry into small cities may well have been revealed in the response to a question put to the deputy chief of the R.S.F.S.R. State Committee on Labor Resources Utilization in 1970; when asked where one could find the order for the deployment of new enterprises, the official answered "in a political economy textbook."[115] Some sign of a more serious approach appeared in an article published in December 1972, by V. Kostennikov, the Deputy Chairman of Gosplan's State Experts Commission.[116] In this article he comments on the location of enterprises in small cities as called for by the XXIV Party Congress, as well as the establishment of a new Commission for the Study of Productive Resources and Natural Resources. Although he does not directly link the two items, his comments on the still-existing Council for the Study of Productive Resources as not "having found as yet its proper place" in Gosplan, after all these years, strongly implies that previous attempts at a rational dispersion of industry were to no avail, and that perhaps now the approach to the problem is changing.

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[111] Perevedentsev, "Migration," 1970, pp. 37–38.

[112] Maykov, "Supplying," 1970, p. 40; Redkach and Trofimov, "Labor," 1970, p. 10; Sazontov, "In Medium," 1968, p. 14; and Alayev, *Effektivnost'*, 1965, p. 79. See also Khorev, *Malyy*, 1972, passim; Kotlyar and Kirpa, "Demographic," 1972, pp. 12–18; and Novikov, "Man," 1970, p. 2.

[113] Kvasha, "Concentration," 1967, pp. 26–31.

[114] *Trud*, November 12, 1967, p. 2. Marchenko argued that these handicraftmen would produce what is demanded by the public—in contrast, it is implied, to the usual practice of producing what is stipulated in the plan.

[115] Maykov, "The Geography," 1970, p. 2.

[116] Kosknnikov, "Territorial," 1972, pp. 28–29.

E. Labor Turnover

1. VOLUME

In 1970, among every 100 (annual average) industrial wageworkers in the U.S.S.R., 30 were separated from their place of employment. Of this number, 21 (70 percent) were involved in "labor turnover," which is defined as quitting voluntarily or being fired for an infraction of labor discipline. Since the 1940 law restricting voluntary quits was removed early in 1956, labor turnover in industry has been about 20 percent per year, and in construction more than 30 percent (table 22). Although some movement is accepted as desirable for upgrading the educational level of workers and creating economic opportunities, such a high level of turnover is considered detrimental by the planners. In 1970, for example, the rates indicated above mean that of the 25.6 million industrial wageworkers in the country, almost 7.7 million were separated for all reasons, including about 5.4 million who were involved in what is strictly defined as labor turnover. As noted below, this vast number of changes and the concomitant impact on labor productivity and occupational structure is rightly a matter of serious concern.

These national figures encompass a wide variation by location and industry, however. For example, in the food industry of Magadan Oblast in 1965, the total displacement (separation) of workers came to 119.9 percent of the annual average employment level, including 45.9 percent for voluntary quits. In nonferrous metallurgy, voluntary quits amounted to 15.4 percent at the national level; it reached a high of 61.1 percent in this industry located in Kamchatskaya Oblast and a low of 4.0 percent in Turkmenistan. Moscow Oblast reported only 6.7 percent.[116a] In contrast to the relative stability of the labor turnover rate for industry as a whole, which changed only by several points during the 1960's, the comparable rates by branch of industry have fluctuated sharply over time. In the coal industry during this same period, the rate decreased by 40 percent, from 25 per 100 workers in 1960 to 15 in 1970. The labor turnover rate for ferrous metallurgy, however, moved in the opposite direciton, increasing by two-thirds, from 9 percent in 1960 to 15 percent in 1970. While improvement was marked in other industries, some still remain much higher than the average for all of industry. The labor turnover rate in the construction materials industry, for example, decreased by almost one-quarter, from 37 percent in 1960 to 29 percent in 1970, but was still over one-third higher than the industrial average.[117]

[116a] Feygin. *Problemy*, 1968, pp. 114–115. Most of the data on quits in the source are reproduced in Feshbach and Rapawy, "Labor," 1970, p. 81.

[117] Based on average rates for industry as a whole given in table 22 and percentage relationships by branch of industry given in Kostin, *Povysheniye*, 1972, p. 136.

TABLE 22.—LABOR TURNOVER AND TOTAL SEPARATIONS OF WAGEWORKERS IN INDUSTRY, CONSTRUCTION, AND RAILROAD TRANSPORT, 1950 TO 1970

[In percent, as reported]

Year	Industry		Construction		Railroad transport	
	Labor turnover[1] (1)	Total separations[2] (2)	Labor turnover[1] (3)	Total separations[2] (4)	Labor turnover[1] (5)	Total separations[2] (6)
1950	15	30.6	18	50	8.3	19.2
1955	19	32.2	31	62	6.6	19.6
1956	38	[3]	[3]	[3]	9.6	22.5
1959	19.6	32.5	40.8	83.3	[3]	21.1
1960	19	[3]	41	[3]	12.6	20.4
1961	20	[3]	[3]	[3]	12.1	20.5
1962	19.9	31.6	39.5	79.1	11.8	20.2
1963	[3]	[3]	[3]	[3]	11.4	19.3
1964	[3]	[3]	36	[3]	10.4	19.3
1965	21	[3]	34	[3]	[3]	[3]
1966	21.7	31.8	38.3	76.2	[3]	[3]
1967	22.1	32.7	38.2	75.3	[3]	[3]
1968	22	[3]	36	[3]	[3]	[3]
1969	21	[3]	35	[3]	[3]	[3]
1970	21.0	30.0	31.6	66.9	[3]	[3]

[1] Labor turnover is defined as the number of workers who quit voluntarily or were fired for infractions of the work rules.
[2] Total separations includes all of labor turnover, as well as separations due to "acceptable" reasons such as, according to an official list, drafted into the Armed Forces, separation on old-age pension, separation on disability pension, termination of temporary work, organized recruitment (orgnabor), birth of a child, accompanying spouse to another location, enrollment into full-time study, and transfer to another enterprise at the direction of a superior organizational echelon. (Savosin, Tekuchest', 1971, p. 28.)
[3] Not available.

Source: Col. 1: 1950, 1956, 1961: Feshbach, "Manpower," 1966, p. 732. Other years: Tarasov, "Obespecheniye," 1972, pp. 41, 42. Col. 2: 1950, 1955: Estimated on the basis of the ratios of labor turnover to total separations, given in Senyavskiy, "Rost," 1966, p. 181. Other years: Tarasov, "Obespecheniye," 1972, p. 41. Col. 3: 1950: Feshbach, "Manpower," 1966, p. 732. 1964: Mitin and Semibratov, "Spravochnik," 1968, p. 201. Other years: Tarasov, "Obespecheniye," 1972, pp. 41, 42. Col. 4: 1950, 1955: Estimated on the basis of the ratios of labor turnover to total separations, given in Senyavskiy, "Rost," 1966, p. 181. Other years: Tarasov, "Obespecheniye," 1972, p. 42. Col. 5: All years: Feshbach, "Manpower," 1966, p. 732. Col. 6: All years: Shvetsov, "Statistika", 1965, p. 48.

Despite the desires of the Soviet Government and massive outlays in investment, accompanied by large movements of individuals, it still has not been possible to achieve a net increase in the population beyond the Urals. Thus, in the period 1959–69, 924,000 more people left Siberia than moved or were transferred there.[118] The movement of the population also is manifested in the regional differences in labor turnover (table 23). These figures show the level of industrial labor turnover in three major economic regions in the eastern part of the country, expressed as percentages of the coefficient of the industrial labor turnover rates in the Central Region of the R.S.F.S.R.

TABLE 23.—LABOR TURNOVER IN INDUSTRY, BY ECONOMIC REGION OF THE R.S.F.S.R.: 1959 TO 1966.

[As percent of Central Region]

Economic region	1959	1960	1961	1962	1963	1964	1965	1966
Western Siberia	219	201	194	192	172	153	161	169
Eastern Siberia	260	268	245	254	234	246	212	207
Far East	228	242	225	230	233	234	195	190

Source: Antosenkov, *Opyt*, 1969, p. 41.

[118] Ivanova, "On the Development," 1973, p. 42.

Although turnover had declined substantially between 1959 and 1966 in each of the regions, even in the latter year it ranged from 69 to 107 percent higher than in the Central Region. The reasons for such sharp differentials lie in personal as well as economic motivations: wages, housing, family ties, climate, educational opportunity, and a lack of personal services being the most important. One rough estimate indicates that the standard of living in Siberia and the Far East is about 25 percent lower than the average for the whole of the R.S.F.S.R.[119] Distance between cities and facilities is another factor which leads to dissatisfaction with living conditions in outlying areas. One author indicates that if someone living on the 70th parallel has to have dental work, he may have to travel to the 65th parallel to visit a dentist; this, says the author, is equivalent to going from Leningrad to Moscow (or about 400 miles) just to have a tooth pulled! Trade facilities are also often widely spread out.[120]

As in the past, wage incentives are being used in the current plan period to draw labor to deficit areas. The current plan calls for either the introduction of regional coefficients in areas such as Western Siberia where they did not exist before or raising the coefficients in regions of the Far East and Eastern Siberia where they previously had been utilized.[121] Perhaps the most astonishing use of differential wages to lure labor from surplus to deficit areas was reported in *Pravda* in 1971. Thus, certain inter-collective farm construction organizations in Latvia were willing to pay migrant labor from the Transcaucasus at a rate of 375 to 550 rubles per month as base wages, and an additional 205 to 659 rubles per month were paid by individual collective farms. An example is provided of two such men from the Transcaucasus, one of whom was paid 1,179 rubles 48 kopecks per month and the other 1,139 rubles 49 kopecks. These latter figures represent an amount more than 9 times the national average for all workers and employees in 1971.[122] While it is reported that in most cases money wages alone are not sufficient to retain labor in labor-deficit areas, one can understand the attraction of pay rates such as these to lure workers even if only for a short period of time before returning to their place of origin.

The impact of labor turnover on the occupational structure is another factor of great concern to Soviet planners. The proportion of all persons changing their place of work who also change their occupation was reported as 40 percent and as 70 percent in two separate 1969 sources.[123] More recent information for those few cities where direct control over job placement has been instituted (see below) reveals that not only turnover but also the rate of change in occupation is reduced. Regardless of which figure is more accurate, Soviet planners and economists consider such a level of occupational mobility to be enormously wasteful, particularly in terms of expenditures for educa-

[119] Breyev and Ruzavina, *Lyudi*, 1967, chapter II. Musatov, *Sotsial'nyye*, 1967, p. 115, includes a table comparing the status of housing in the European part of the Soviet Union with that in the northern and eastern regions. In most areas of the European part, a much higher portion of housing has water supply, sewage, and gas than does housing in the east and north. A slightly smaller proportion of homes in the eastern portion of the country are centrally heated. Also see Toplin and Gilinskaya, "Regulating," 1973, p. 123 ff., and Pchelintsev, "On the Formation," 1971, p. 131. Pchelintsev calculates the cost differential for a basket of 11 products to be 400 rubles per year higher in Khabarovsk than in Kiev.

[120] Yanovskiy, "Man," 1968, pp. 228–237.

[121] For example, see Gosplan, *Gosudarstvennyy*, 1972, pp. 288–289.

[122] Kvite, "Which," 1971, p. 3, and *Nar. khoz. 1922–72*, p. 350.

[123] Antosenkov, "What," 1969, p. 2, and Batyshev, "Choice," 1969, p. 10. Also see Zaytsev, "Replenishment," 1970, p. 126, who indicates that within 4–5 years after leaving school more than half the graduates of secondary schools changed their place of work and one-third changed their occupation. Also see Krevnevich, "Vocational," 1971, pp. 69–70.

tion. One example will illustrate the basis for their concern, not only in terms of direct costs but also in terms of the lag in increasing the level of labor productivity so urgently needed on the farms. Between April 1, 1965, and April 1, 1969, there was a net increase of 263,000 "mechanized cadres" (i.e., essentially machinery operators) on collective and state farms. Yet during the years 1965–69 a total of 3,578,000 "mechanized cadres" were trained in vocational-technical schools or in courses given on the farms.[124] Thus, the net addition was only 7 percent of the number of persons trained in this occupational category. Apparently, about 16 percent of the newly trained cadres replaced the natural loss of former such persons, 77 percent were drafted into the armed forces or went to work in other branches of the national economy, and only about 7 percent contributed to growth in the number of cadres.[125] Since it costs an average of 600–700 rubles to train each qualified machine operator, the losses to the government are immense, even though the persons are employed elsewhere.[126] During harvest time, however, many of these persons are undoubtedly the first ones dispatched by their enterprises and organizations to work in the fields.

2. LEGISLATIVE AND ADMINISTRATIVE ACTIONS

It has been variously estimated that the average worktime lost between jobs by persons involved in labor turnover ranges from 20 to 30 days.[127] In addition, labor productivity of these individuals is usually some 25–30 percent below normal in the period immediately before departure and in the first month of the new job; during the second month in the new job it is 10 percent below normal; during the third month, 3 to 5 percent below normal; and only in the fourth month does it regain a standard level.[128] On the basis of these factors, combined with the total rate continuing at the levels indicated above, a series of legislative and administrative actions has been taken, particularly in the last 4 years, to combat "excessive" labor turnover. One of the earlier measures, established during implementation of the economic reform of 1965, was to authorize the award of bonuses for uninterrupted service at a given enterprise.[129] This measure was expected to be much more effective than the procedure used previously which involved payments for total length of service. The new payment system was designed to give consideration to quantity and quality of work, in addition to years of service, in determining the amount of the bonus. It apparently has not been effective in keeping workers at their jobs, however.

In order to control labor turnover, more and more authority has been given to the state committees on labor resources utilization. In 88 of 129 cities in the R.S.F.S.R. with a population of 100,000 or more persons, new "Bureaus for the Job Placement and Information for the Population on the Requirements of Enterprises, Construction Sites and Organizations for Workers and Employees" had been established

[124] *Nar. khoz. 69*, pp. 427, 535, and *Nar. khoz. 68*, p. 565.
[125] The figures given in Zalevskiy, "More Fully," 1972 p. 68, were changed slightly (by 2 percentage points) to correspond with the data cited here for the net growth in mechanized cadres.
[126] Karpukhin, "Better," 1969, p. 2.
[127] Among others, see Maykov, "Labor," 1972, p. 29; Manevich, *Osnovnyye*, 1971, p. 25; and Malmygin, "Required," 1970, p. 2.
[128] See Feshbach, "Manpower," 1966, pp. 727–735.
[129] Roshchin, "Voluntary," 1967, p. 4.

by mid-1972.[130] A Central Bureau of Job Placement and Population Information has been organized in Moscow to coordinate and oversee the work of individual Bureaus in all cities of the R.S.F.S.R., including that of job vacancies. As part of this work a so-called ASU (*avtomatizirovannaya sistema upravleniya*—automatic system of management) on the distribution of labor resources is being created. The intention is to provide information from all cities in the republic to a "central memory machine."[131] Also, a variety of experiments is being carried out by the local offices of these committees in Leningrad, Moscow, Ufa, and Kaluga, which portend some kind of nationwide restriction on the freedom of movement of labor. These experiments, a brief description of which follows, are the logical consequence of the taut labor market and the nonresponse of the population to moral and material incentives to remain at their place of work. Since, as will be seen, they have been quite successful in some instances in cutting back on the number of days between jobs, on the proportion of persons who also change occupation when changing jobs, and to some degree on the rate of labor turnover (but still too early to be reflected in the national figures), it appears doubtful that a full return to the 1940–56 law making it a criminal act to leave work without permission will be reinstituted. Nonetheless, the necessity for an All-Union State Committee on Labor Resources Utilization, rather than 15 disparate committees coordinated through a department of Gosplan, is becoming more and more evident.

In May 1969, a new measure was promulgated to restrict labor turnover in Leningrad. Each person fired for an infraction of labor discipline must now report to the new Labor Resources Utilization Administration of the city for assignment to a low-skill and low-paying job for a period of 3 months. In addition, such persons are not paid bonuses during this period and are assigned to a lower place on the waiting list for housing. This harsh punishment is applied to all workers, regardless of specialty or qualification. In the event that these measures are insufficient to engender reasonable behavior, the regular legislation on antiparasitism is applied. This may entail a 1-year sentence of imprisonment or corrective labor.[132] Perhaps as a result of this explicit set of regulations or perhaps as a result of the new Bureau within the local office, it is reported that changes in occupation in the city have dropped radically from 56 of every 100 changes in place of work to "only" 24 of every 100. While direct data are not given for the changes in the labor turnover rate itself, it is implied that it also has dropped.[133] Early in 1970, the Moscow Administration on Labor Resources Utilization created a "public" commission on job placement in each rayon of the city, consisting of deputies of the rayon Soviet, representatives of the Administration itself, and representatives of economic and public organizations (presumably including the party) to deal with the problem. Any individual fired for infractions of the work rules is "invited" to meet with a commission. In the fall of 1972, these organizations were changed to formal commissions on labor resources utilization.[134] Future job placement can be accom-

[130] Some 160,000 persons were placed at work by these Bureaus in 1967 and over 2.5 million in the 3 years following. Andreyev, "Man," 1972, p. 2; *Nar. khoz. RSFSR 71*, p. 20; Antosenkov, "Labor," 1971, p. 176; and Maykov, "Labor," 1971, p. 11.
[131] Novikov, *Normativnyye*, 1972, pp. 508–511, and Larionov, "How," 1971, p. 2.
[132] Solov'yev, "Not Merely," 1970, p. 2.
[133] Andreyev, "Man," 1972, p. 2.
[134] "On the Commissions," 1972, pp. 23–25, and Novikov, "Man," 1970, p. 2. More formal rules for the work of a permanent Bureau of Job Placement and Population Information is given in "On the Procedure," 1972, pp. 21–22.

plished only through their auspices. In the two cities of Ufa and Kaluga, all new jobs must be secured only through the Bureau of Job Placement and Population Information formed in each city. The directive of the Council of Ministers R.S.F.S.R., adopted on October 15, 1970, requires all enterprises and organizations to submit information about job vacancies to their respective Bureaus.[135] No enterprise will be dispatched new labor if its plans and reports indicate that it is fully staffed.[136] The Kaluga experiment, based on the same directive, apparently is somewhat more aggressive, and despite any protestations to the contrary before the All-Union Census of 1970, uses census information to contact persons not working for any reason. Although only 650 persons revealed as not working in the census were placed at jobs in 1971, it appears that a pattern has been set.[137]

Another major variant in this series of experiments related to the taut labor market is seen in the activities of the Latvian State Committee on Labor Resources Utilization. A Republican Interagency Council of Vocational Orientation of Young People has been formed in the republic to provide general supervision, and a Department on Vocational Orientation and Job Placement of Young People has been organized. This department is responsible for coordination of work in this area by all ministries, agencies, enterprises, and organizations in the republic, and of all secondary educational institutions, in order to meet the demands of the republic's economy for trained workers.[138]

On February 23, 1970, the Central Committee of the Communist Party and the Council of Ministers U.S.S.R. issued a joint directive entitled "On Measures for the Strengthening of the Struggle with Persons who Shun Socially Useful Work and Lead Anti-Societal Parasitical Ways of Life" which ordered each republican council of ministers to give enforced work assignments to persons who come under the definition of the act. The Uzbek Supreme Soviet issued a decree shortly thereafter in which parasites are defined as able-bodied men 18–59 years of age and women 18–55 years of age who have not worked for more than 4 months. In April 1970, the Presidium of the R.S.F.S.R. Supreme Soviet re-enacted an anti-parasite law with more teeth against the voluntary jobless, and in May the Armenian Supreme Soviet joined the drive.[139]

On July 15, 1970, the Presidium of the Supreme Soviet U.S.S.R. adopted a new labor code which became effective January 1, 1971. Following through on the trend indicated in the actions described above, article 55 reads:

> "Work incentives . . . workers and employees who have successfully and conscientiously performed their duties shall be granted priority and privileges in the areas of social, cultural, housing, and personal services (trips to sanitariums and rest homes, improvements in housing conditions, etc.). Such workers shall also be given priority in job advancement. . . ." [140]

Clearly one major purpose of the new code is to reduce labor turnover. The same goal was stated in an article in a house journal of the

[135] See directives in Novikov, *Normativnyye*, 1972, pp. 511–514.

[136] Among the benefits accruing to the Government is a reported reduction in the number of days between jobs from 30 to 21 days in 1971. Krasnov, "Cadre," 1971, p. 2, and Mironenko, *"Khozraschet,"* 1972, p. 17.

[137] *Trud*, February 2, 1972, p. 2.

[138] Pakaln, "Vocational," 1971, pp. 82–89.

[139] *Sovetskaya Hayastan*, May 29, 1970, p. 2; *Pravda Vostoka*, March 28, 1970, p. 3; "Drawing," 1970, p. 144; and Boiter, "The Parasite," 1970, 8 pp. Follow-up action by the Council of Ministers R.S.F.S.R. and the R.S.F.S.R. State Committee on Labor Resources Utilization is given in Novikov, *Normativnyye*, 1972, pp. 495–497.

[140] *Osnovy*, 1970, p. 25.

State Committee on Labor and Wage Problems which made a direct condemnation of persons who move from place to place. According to this source, incentives are designed to reward "continuous and irreproachable work." [141]

F. Labor Productivity

Faced with a taut manpower supply situation now, and a serious, demographically predetermined downturn in the future new supply of labor, especially in the next decade, Soviet planners and economists have turned more and more attention to the old problem of increasing labor productivity, seeking thereby to ease demand and in effect achieve additional inputs to the labor market. For the present 5-year plan, Soviet planners have calculated that achievement of the productivity goals will engender a labor saving of 32 million persons in the material production sphere, of which, 11–12 million could be saved in industry.[142] In addition, of course, a growth in labor productivity can yield significant additional benefits through savings in wages. As the economist Lebedinskiy points out, when the growth of labor productivity exceeds that of wages, "part of the national income used for the payment of persons employed in material production [can be used] for the expansion of production, for the nonproductive sphere of the national economy, for maintenance of the members of society not able to work, and for defense needs." [143]

During the current 5-year plan period 87 percent of the growth of industrial output, 95 percent of the growth in construction output, and all of the growth in railroad transport freightwork and in agriculture are to come from gains in labor productivity.[144] If this is to be achieved, there will be only an annual rise in industrial employment of less than 1.3 percent, which would be one-third to one-half the rate of growth during the years 1950–70 (see table 9). There will be virtually no increase in employment in construction, which until recently was a growth sector, none at all in the freight portion of railroad transport—although this activity has had relatively stable employment during the last decade—and if the plan were fulfilled, a slight decline in the employment level of agricultural activities of state collective farms. Clearly the plan for achieving growth in these significant portions of the economy is based directly on raising the productivity of labor (and capital), and chances for fulfilling the plan's major goals depend heavily on the success attained in the productivity drive.

It is instructive, therefore, to look at the past and current experience in achieving productivity goals. As part of the preparation for the Seven-Year Plan of 1959–65, control figures were issued for the growth of industrial labor productivity in each year, with a total growth of

[141] Pyatakov and Chekov, "A New," 1970, p. 6.
[142] Gosp'lan, *Gosudarstvennyy*, 1972, p. 86, and Kasimovskiy, "Labor," 1972, p. 82.
[143] Lebedinskiy, "Basic," 1968, p. 30. Following the excessive wage growth in 1968, the U.S.S.R. Council of Ministers resolved that if this should happen again, an equal amount of the material incentive fund would not be expended. See Sukharevskiy, "Economic," 1969, pp. 10–27.
[144] Gosplan, *Gosudarstvennyy*, 1972, pp. 87 and 195. Both the industry and construction shares were reduced in comparison to the draft directive expectations of 87–90 percent for industry and 98 percent for construction. See Kotov, "Rates," 1971, p. 6.

50 percent planned for the entire period. During the course of the plan period, annual goals were set, and in each case they were lower than the goals set in the original control figures—except for 1965, which was the last year of the plan period and apparently was given the typical "storming" goal in an attempt to meet the plan (table 24). In addition, during the course of each year changes were made in the annual, approved goal. This second set of changes lowered the overall growth rate of 46 percent (revised downward from the original 50 percent) even further to 34 percent. The only annual figure which remained unchanged was that for the last year, 1965. Thus, the record for this plan period shows that the first year was one of good growth, apparently due to enthusiasm maintained under the strong encouragement of the political *apparat*. In all other years performance was below the original control figures, again except for 1965, when unquestionably the "storming" effort raised the annual growth rate to a level 25 percent higher than the performance in 1964. In all years, the 42 percent growth in labor productivity was 16 percent lower than the original plan goal.

TABLE 24.—GROWTH OF LABOR PRODUCTIVITY IN INDUSTRY: 1959 TO 1965

[In percent of the previous year]

Year	Annual plan figures			Actual performance
	Control figures	Approved	Changed (by end-of-year)	
1959–65 [1]	50	46	34	42
1959	5.4	5.4	5.6	7.4
1960	6.0	5.8	3.9	5.4
1961	6.3	6.0	4.1	4.4
1962	6.6	5.6	4.2	5.9
1963	6.8	5.6	4.3	4.8
1964	6.4	4.5	3.1	4.0
1965	4.1	5.7	5.7	5.0

[1] Percent increase by 1965 over the level in 1958.

Source: Lel'chuk, "Industrial," 1970, p. 20.

As can be seen from table 25, the draft directives for the following 5-year plan period, 1966–70, called for a growth of 33–35 percent in labor productivity in industry. Actual performance fell just short of the goal and registered 32.4 percent, which was an improvement over the rise of 25 percent during the previous 5-year period. The plan directives for 1971–75 call for industrial labor productivity to grow by 38.8 percent, 4–6 percentage points higher than the plan goals in the previous 5-year period. The achievement in industry during the 1966–70 period, however, did not match the achievement in agriculture, where labor productivity rose by 35 percent, or nearly double the 18 percent rise achieved in the years 1961–65. The projected 38 percent productivity increase during the years 1971–75 is only slightly higher. The growth of 37 percent planned for labor productivity in construction during the 1971–75 period would be a major achievement in comparison with the increase of 22 percent registered in the years 1966–70; this latter rise was significantly less than the 29 percent rise attained during the period 1961–65.

TABLE 25.—GROWTH OF LABOR PRODUCTIVITY, BY BRANCH OF THE NATIONAL ECONOMY AND 5-YEAR PERIOD: 1961 TO 1971

[In percentages, as reported]

Branch of the national economy	1961 to 1965		1966 to 1970				1971 to 1975		Of which, 1971			1972		
	Actual		Plan		Actual		Plan		Plan		Actual	Plan		Actual
	Total	Average annual rate	Total	Average annual rate	Total	Average annual rate	Total	Average annual rate	5-year plan directive	Annual plan	Annual rate	5-year plan directive	Annual plan	Annual rate
Industry	25	4.6	33–35	5.9–6.2	32.4	5.8	38.8	6.8	5.9	6.	6.3	6.7	6.1	5.2
Construction	29	5.3	35–40	6.2–7	22	4.1	37	6.5	6.4	(1)	5	6.4	(1)	5.4
Agriculture	18	3.4	40–45	7–7.7	37.1	6.5	38	6.6	6.7	(1)	2	6.7	(1)	−2.8
Railroad transport	31	5.5	23–25	4.2–4.6	27	4.9	22.6	4.2	3.7	(1)	4.5	4.2	(1)	3.8

[1] Not available.

SOURCE

1961–65: Kostin and Kostin, Vsemerno, 1971, p. 11.
1966–70: Ibid,. and Gosplan. Gosudarstvennyy, 1972, p. 87. The later Gosplan source, rather than Kostin and Kostin, was used for the figures on actual performance in industry and agriculture.
1971–75: Gosplan, Gosudarstvennyy, 1972, pp. 87 and 345.
1971 Plan: 5-year plan directive: Ibid. The average annual rate for agriculture was based on the projected growth over the entire period; annual plan: "Productivity," 1972, p. 2.
1971 Actual: Pravda, Jan. 23, 1972, p. 1.
1972 Plan: "Delay," 1973, p. 2; 5-year plan directive: Gosplan, Gosudarstvennyy, 1972, p. 345; The average annual rate for agriculture was based on the projected growth over the entire period. annual Plan: Izvestiya, Nov. 25, 1971, p. 3.
1972 Actual: Pravda, Jan. 30, 1973, p. 1.

An increasing reliance upon a rise in productivity is evident when the figures are compared with those of past plans. Thus, the present directives call for 87 percent of the increase in output to be attained through rising productivity, whereas the directives for the 1966–70 plan stipulated at least 75 percent and the plan for the preceding 5 years had called for less than 66 percent.[145] Lebedinskiy, writing in 1969, indicated that productivity gains would contribute "about 70 percent" during the years 1966–70, not the "more than 75 percent" which had been indicated in 1966. It was later revealed that productivity gains actually contributed 62 percent of the growth in output in 1961–65 and 73 percent in 1966–70.[146] The goal of 87 percent as a contribution to growth in output from rising labor productivity during the years 1971–75 is at a level much more difficult to achieve and maintain, and perhaps beyond the realm of possibility, particularly as can be seen from the major shortfalls in the 2 years of the current plan (except for industry and railroad transport in 1971).

The relatively poor performance in achieving planned productivity goals during the 7-year plan period must certainly have contributed to the decision to undertake a program of economic reform in 1965. Numerous factors contributed to the failure to raise productivity in accordance with the plan, including: poor organization of work; the continuing high ratio of auxiliary to basic production workers; the low level of mechanization (i.e., the high proportion of manual workers); high worktime losses during the shift; and a low degree of production specialization. Most of these factors have long been problems, and most of them continue to be problems.

As noted above, the large numbers of workers assigned to less-productive, auxiliary jobs contribute to a low level of productivity. In all of industry, slightly less than half of all wageworkers are auxiliary workers (10,384,000 of 21,737,000 on August 1, 1969).[147] In machine-building and metalworking this share was 54 percent in 1959 and 49 percent in both 1965 and 1969. A breakdown of the functional activities of all workers in the machine-building and metalworking industry in 1965 shows that (for auxiliary worker-type activities) 10.2 percent were performing transport and loading work; 4.5 percent were engaged in storage and distribution; 12.2 percent in maintenance of machinery; 5.6 percent in quality control; 1.8 percent in supplying electric power; and 3.2 percent in instrument and equipment making.[148] Another factor affecting productivity is the degree of mechanization, an area in which very little progress has been made. In 1959, manual workers comprised about 55 percent of all workers; in 1962, this proportion had dropped to 53 percent, and in 1965, it was 52 percent. At the Ninth Congress of the Metallurgical Industry Trade Union held in 1967, it was noted that in both ferrous and nonferrous metallurgy "more than one-half of all workers are engaged in manual work." In the 8 years preceding the Congress, the number of manual workers as a proportion of all workers in ferrous metallurgy declined by only 2.4 percentage points.[149] A major reduction of manual work can be accomplished only at the cost of heavy investment.

[145] Litvyakov, "In the New," 1966, p. 15.
[146] Ivanchenko, "Chief," 1971, p. 2, and Lebedinskiy, "Basic," 1969, p. 28.
[147] Shafranova, *Professional'nyy*, 1972, pp. 55 and 61.
[148] Mil'ner, "The Coefficient," 1969, p. 19, and Akopyan, "On the Interrelationship," 1966, p. 50.
[149] "Ninth," 1967, p. 2, and Slepakov, "Socialism," 1967, p. 10.

In an effort to increase productivity, and as part of the reform programs initiated in 1965, the Soviet Government reduced the length of the workweek from 6 to 5 days (but retaining the total of 41 hours of work per week), giving the individual more leisure in terms of days off. Simultaneously, however, this resulted in a reduction of the average number of days worked per year beyond the reduction related to the change—especially in industry. As the data in table 26 show, the average industrial wageworker worked 13 fewer days in 1967 than in 1966 and 30 fewer days in 1969 than he did 3 years earlier, a drop of nearly 12 percent. However, in the following 2 years, for which data are available, some slight improvement was evident. The improvement in worktime utilization indicated by the increase in the number of man-days worked per year is not, however, accompanied by an equal increase in the number of man-hours worked per person. For the first time in the postwar period, data have been published on the number of man-hours worked by branch of industry (table 27). These data when combined with the corresponding employment enable us to determine the annual average number of hours worked by industrial-production personnel in each branch of industry. Thus, as shown in table 27, the total number of hours worked by all persons increased by 2.00 percent in 1971 relative to 1970, or very near the increase in man-days worked in industry (2.25 percent—see table 26, line 3). However, when the increase in employment is taken into account, the increase in the number of hours worked per person is only 0.61 percent, or less than one-third the rate indicated by man-days alone.

TABLE 26.—NUMBER OF DAYS WORKED BY INDUSTRIAL WAGEWORKERS: 1960 TO 1971

Line number	Item	1960	1965	1966	1967	1968	1969	1970	1971
1	Annual average number of wageworkers (thousands)	18,887	22,576	23,283	24,019	24,668	25,132	25,631	26,077
2	Average number of days worked per wageworker	266.9	266.4	263.1	249.6	234.0	232.6	234.1	235.1
3	Number of man-days worked (millions), total	5,040.9	6,014.2	6,125.8	5,995.1	5,772.3	5,845.7	6,000.2	6,135.4
4	Index of man-days worked (1965=100), total	83.8	100.0	101.9	99.7	96.0	97.2	99.8	102.0

Source:
Line 1:
1960, 1965, 1970, 1971: Table 10.
1966-68: Feshbach and Rapawy, "Labor," 1970, p. 79.
1969: "Nar. khoz. 70," p. 158.
Line 2: "Nar. khoz. 1922-72," p. 148; "Nar. khoz. 69," p. 167; and "Nar. khoz. 68," p. 207.
Line 3: Line (1) × line (2).
Line 4: Computed from figures in line (3).

TABLE 27.—TOTAL AND ANNUAL AVERAGE NUMBER OF MAN-HOURS WORKED, BY BRANCH OF INDUSTRY: 1970 AND 1971

Branch of industry	Total man-hours worked by industrial-production personnel (in millions)		Index of man-hours worked (1970=100)	Annual average number of industrial-production personnel (in thousands of persons)		Index of employment (1970=100)	Annual average number of man-hours worked by 1 person		Index of average number of man-hours worked (1970=100)
	1970	1971		1970	1971		1970	1971	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total	57,405	58,554	102.00	31,593	32,030	101.38	1,817	1,828	100.61
Extraction	6,453	6,423	99.54	3,597	3,570	99.25	1,794	1,799	100.28
of which, mining	3,727	3,710	99.54	2,130	2,107	98.92	1,750	1,761	100.63
Manufacturing	50,952	52,131	102.31	27,996	28,460	101.66	1,820	1,832	100.66
Electric power	1,187	1,214	102.27	633	645	101.90	1,875	1,882	100.37
Coal	1,898	1,875	98.79	1,120	1,090	97.32	1,695	1,720	101.47
Ferrous metallurgy	2,457	2,457	100.00	1,359	1,352	99.48	1,808	1,817	100.50
Chemical and petrochemical	2,771	2,834	102.27	1,568	1,598	101.91	1,767	1,773	100.34
Machine-building and metalworking	21,891	22,641	103.43	12,017	12,369	102.93	1,822	1,830	100.44
Timber, woodworking, and paper and pulp	5,211	5,203	99.85	2,848	2,829	99.33	1,830	1,839	100.49
Woodworking	2,419	2,484	102.69	1,341	1,345	100.15	1,804	1,850	102.55
Furniture	839	888	105.84	462	483	104.55	1,816	1,839	101.27
Paper and pulp	479	484	101.04	259	260	100.39	1,849	1,862	100.70
Construction materials	3,689	3,785	102.60	1,996	2,039	102.15	1,848	1,856	100.43
Glass and chinaware	480	499	103.96	262	272	103.82	1,832	1,835	100.16
Light industry	9,096	9,184	100.97	5,019	5,036	100.34	1,812	1,824	100.66
Textiles	3,817	3,862	101.18	2,113	2,109	99.81	1,806	1,831	101.38
Garment	3,846	3,866	100.52	2,112	2,130	100.85	1,821	1,815	99.67
Leather, fur, and footwear	1,375	1,386	100.80	(1)	(1)	(1)	(1)	(1)	(1)
Food industry	5,484	5,548	101.17	2,901	2,903	100.07	1,890	1,911	101.11
Backing	1,031	1,037	100.58	556	559	100.54	1,854	1,855	100.05
Tobacco and makhorka	70	70	100.00	37	38	102.70	1,892	1,842	97.36
Meat and milk	1,345	1,357	100.89	716	719	100.42	1,878	1,887	100.48

[1] Not available.

SOURCE
Cols. 1, 2, 4, and 5: "Vestnik statistiki," No. 11, 1972, pp. 93, 95.
Col. 3: Col. 2 divided by col. 1.
Col. 6: Col. 5 divided by col. 4.
Col. 7: Col. 1 divided by col. 4.
Col. 8: Col. 2 divided by col. 5.
Col. 9: Col. 8 divided by col. 7.

The economic reform of 1965 was supposed to solve a variety of problems, but it apparently has met with only mixed success. In January 1970, the General Director of the Leningrad Machine-Tool Combine, G. Kulagin, wrote that "the majority of managers" would state that "the reform has not yielded all the expected results," [150] This evaluation corresponds to the results of a survey of 241 managers of enterprises located in Siberia and the Far East. A bare majority (56 percent) indicated that the reform did not substantially expand their autonomy, and an even larger group (79 percent) felt that the important area of material-technical supply was not improved by the reform.[151] A similarly high proportion of the managers (78 percent) noted their need for more authority in the area of labor and wages.

In July 1967, the State Committee on Labor and Wage Problems issued a directive which authorized the large Shchekino Chemical Combine to undertake a program to increase production by reducing the total number of personnel and giving the wage savings as incentives to the remaining workforce.[152] Redundant labor was to be encouraged to move to labor-deficit activities or regions. This, according to the plan, would provide additional labor without increasing the total number of workers. The critical importance of this experiment is obvious, given the taut supply of manpower. In June 1970, nearly 3 years after it was initiated, the Shchekino experiment was being tried at 55 other enterprises; by the spring of 1972, this had spread to a total of 300 enterprises, only six-tenths of 1 percent of the some 52,000 industrial enterprises on an independent balance. In July 1972, S. Novozhilov, a Deputy Chairman of the State Committee on Labor and Wage Problems, indicated that work was being completed on expanding the application of this experiment, but nothing has been heard since to indicate any major change.[153] In 1970 it was reported that the results to date had not measured up to expectations. Apparently about half of all workers released under this program have been retained by their old enterprise and assigned to different jobs, with only a minimal decrease in employment.[154] Gains in production have been achieved more through rationalization of operations than through reduction of employment. The results of the experiment emphasized the long-felt need for improved management, and in February 1971 the government opened an Institute for the Management of the National Economy in Moscow.

The slow implementation of the Shchekino experiment is very largely based on the reluctance of the enterprise manager to face up to the problems it creates. An enterprise is classified for wage-scale purposes on the basis of the number of people working in it. This means that the amount of funds to be deducted from profits for incentives depends directly on the size of employment. The reduction of

[150] Kulagin, "Road," 1970, p. 1.
[151] Karagedov, "Reform," 1970, pp. 101–107.
[152] See *Byulleten'*, no. 7, 1969, p. 6. Also, see Bush, *The Implementation*, 1970, especially pp. 30–34, for more details on the Shchekino experiment to that date.
[153] See Novozhilov in *Literaturnaya gazeta*, July 26, 1972, p. 10; Rogovskiy, "Accelerating," 1972, p. 91; and *Vestnik statistiki*, no. 11, November 1970, p. 70. According to data in the latter source, there was a net average increase of 1,049 new enterprises on an independent balance during the period January 1, 1967, and January 1, 1970, which, when extrapolated, yields an estimate of 51,989 enterprises of an independent balance on January 1, 1972.
[154] Kheyfets, "Problems," 1970, p. 106. Also, see Moyev, "Shchekinskiy," 1972, p. 10, and ——, "Success," 1969, p. 10.

employment to be expected under the goals of the experiment would automatically reduce these incentive funds. Another disincentive for reducing employment is the annual requirement to send workers to help in the fields at harvest time.[155] In order to continue to operate his plant without disruption the manager must have excess labor to provide for emergencies, labor turnover, etc. This is succinctly summarized in the statement of one plant director:

> How will I get along if I am frequently ordered to send people to construct housing and make civic improvements? Freight cars are not always delivered on time, and I have to look for loaders on the side. Nor can I lose sight of personnel turnover. You see, the plant plan must be fulfilled, come hell or high water.[156]

Resistance to the Shchekino program also comes from the higher-level bureaucracy which is unhappy about the lack of central control over wage-setting. And, finally, it would seem that workers laid off under the Shchekino program and thus deprived of a chance to earn the higher wages to be paid to the remaining workers, would also object to the entire program—if they could express their opinion.

On December 11, 1970, the Council of Ministers U.S.S.R. adopted a resolution on a sequence of measures designed to implement a program similar to the Shchekino experiment which had initially been introduced as part of the 1965 reform. The State Committee on Labor and Wage Problems, Gosplan, the Ministry of Finance, and the All-Union Central Council of Trade Unions subsequently issued a set of so-called "Conditions" addressed to the workforce of enterprises involved in this program.[157] Since these "Conditions" apply to all workers in enterprises producing 93 percent of the industrial production in 1970, they would have, if implemented, a wide impact on rationalizing the utilization of labor and stimulating higher productivity.[158] The state committees on labor resources utilization have been given the specific assignment to work out appropriate measures, jointly with the interested ministries, agencies, and enterprise managers, for the retraining or placement of workers declared redundant in the course of implementing personnel reductions.

Although until now not directly linked to the Shchekino experiment, the state committees on labor resources utilization afford an effective avenue for redirecting the redundant labor uncovered in the plants. In the Byelorussian committee, a special department was formed to deal not only with the rationalization of production, improvements in work organization, workers transferred by order of a ministry, and workers available at the completion of a task (such as a construction project), but also with workers available on the market due to a reduction in force.[159] These factors on a national level, combined with the need for retraining of workers displaced in a given

[155] See Boldyrev, "The Continuation," 1972, p. 2; "For Spring," 1970, p. 3; Kuznetsov, "Workers," 1969, p. 1; Moyev, "Success," 1969, p. 10; and Mashenkov, *Ispol'zovaniye*, 1965, p. 129.
[156] Suslyak, "Horizons," 1971, p. 2.
[157] *Ekonomicheskaya gazeta*, no. 1, January 1971, p. 8.
[158] *Izvestiya*, February 4, 1971, p. 1.
[159] Romma and Urzhinskiy, "Activities," 1968, p. 92.

factory or town, has engendered a very cautious and guarded discussion of the granting of unemployment benefits—regardless of what euphemism is substituted. In 1969, at an All-Union Conference of Economists of the Chemical Industry, P. Sharov, the Director of the Shchekino Chemical Combine, indicated that the 2 years of the experiment made it abundantly clear that there must be a "new approach to resolving the questions of job placement of displaced workers, [and] material payments where needed during the time of retraining and other questions." [160] In February of the following year, the Council of Ministers U.S.S.R. directed that for a period not to exceed 3 months, the average wages earned prior to release from work would be paid to persons released from administrative work while undergoing retraining.[161]

Two other forms of unemployment aid have been applied or suggested. In the Yakut A.S.S.R. and Magadan and Kamchatskaya Oblasts in the northeastern region, where labor turnover is high and seasonality of employment is very sharp, a form of unemployment aid is paid in the guise of wages to workers of the open-pit mining and fishing industries. In these areas, work is closed down during the extremely cold winter months. Since it is too expensive to bring seasonal workers from the central and western regions every year, alternative jobs are found for some workers in repair work, logging, etc. The majority, however, are "in practice not employed from December through May." Instead they are paid wages (though at a lower level than they receive during the regular period of operations) as a means for preventing their out-migration.[162] The economists Sonin and Miroshnichenko call for the formation of a "mobile reserve" formed primarily from persons displaced because of technical progress, i.e., technologically unemployed. For these persons a holding operation is proposed either in the form of work at "reserve enterprises" where they could be paid for producing spare parts or in the form of retraining. In the latter case, in contrast to the practice authorized for persons formerly employed in administrative work, these authors suggest that since the difference between stipends being paid while at study and wages is relatively small, wage should not be paid to the (re)trainees—the cost to the State, according to these authors, would be too high if such wages were to be paid.[163] (It is unclear why they claim the marginal cost would be "too high" if the difference between stipends and wages is relatively small.) Regardless of which technique, or combination of techniques, is used, it appears likely that some equivalent of unemployment aid will be enacted to overcome frictions in the labor market.

[160] Kravchenko, "All-Union," 1970, p. 151.
[161] See *Sotsialisticheskiy trud*, no. 5, May 1970, p. 145. Also see Gwertzman, "Russian," 1970, p. 19, who cites an earlier proposal by the economist Yefim Manevich for money aid during retraining. Manevich refers again to this measure in a volume issued in 1971 under his editorship. Manevich, *Osnovnyye*, 1971, p. 17.
[162] Loginov and Moskvin, "Supplying," 1962, pp. 23–24, cited in Feshbach, "Manpower," 1966, p. 767.
[163] Sonin and Miroshnichenko, "On the Optimization," 1972, in Fedorenko, *Problemy*, 1972, pp. 266–268.

Appendix A

SOURCES AND METHODOLOGY FOR TABLE 14

Population

Lines 1–4

Estimates and projections prepared by the Foreign Demographic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce. These figures are consistent with the estimates and projections contained in the paper by Leedy in this volume. The official Soviet definition for the able-bodied population was used—males 16–59 years of age and females 16–54 years of age.

Employment

Total (line 5)

Sum of armed forces (line 6) and civilian employment (line 7).

Armed Forces (line 6)

1950, 1953, 1955–61: Reed, *Estimates*, 1967, p. 22.
1951–52, 1954: Interpolated linearly.
1962–72: Institute, *Military*, annual issues, 1962 to 1972.
1973–80: Assumed to remain constant at the 1972 level.

Civilian Employment (line 7)

Sum of the nonagricultural (line 8) and agricultural (line 14) sectors.

Nonagricultural Sectors (line 8)

Sum of industry (line 9), the other nonagricultural sectors (line 10), and independent artisans (line 13).

Industry (line 9)

1950–71: Column 4, table 8.
1972–74: Interpolated linearly for industry and other branches of the economy in the state sector for 1971–74. A percentage distribution for 1972 was derived for all branches and applied to the reported total employment for 1972 of 95,200,000 (*Izvestiya*, January 30, 1973, p. 3) to obtain 1972 employment by branch. For 1973–74, employment was again interpolated linearly between the derived data for 1972 and the projected data for 1975.
1975: Gosplan, *Gosudarstvennyy*, 1972, p. 89.
1976–79: Interpolated linearly.
1980: 1975 employment was increased by 6.5 percent, the aggregate growth rate for the period 1970–75.

Other Nonagricultural Sectors (line 10)

Sum of services (line 11) and other (line 12).

Services (line 11)

1950–71: Sum of columns 9–16, table 8.
1972–75: The new plan publication (Gosplan, *Gosudarstvennyy*, 1972, p. 89) gives 1975 employment figures for most branches of the state sector directly. The residual, which comprehends forestry, credit and insurance organizations, government administration, and "other," was disaggregated for 1975 by applying the 1965–70 growth rates to the 1970 employment. A percentage distribution of the projected employment for these branches was then applied to the 1975 residual figure of 4,560,000. Then the procedures used in industry (line 9), for the corresponding years, was followed. Data for branches shown in columns 9–16, table 8, estimated in the manner described above, were combined to obtain employment for the service sector.
1976–79: Interpolated linearly.
1980: Obtained by a least squares linear regression expressing the trend of the size of employment in the service sectors during the period 1966–75 ($Y = -2.273{,}213 + 1169\,X$, where Y is employment in the service sectors and X is the calendar year.)

Other (line 12)

1950–71: Sum of columns 5–8 and 17, table 8.
1972–80: Sum of branches in columns 5–8 and 17, table 8, derived in a manner described under services (line 11) for the corresponding years. The figure for

1980 was obtained by a least squares linear regression expressing the trend of the size of employment in the "other" sector during the period 1966–75 (Y= −1,085,164+561 X, where Y is employment in the "other" sector and X is the calendar year.)

Independent artisans (line 13)

1950, 1958: An estimate of 1,591,000 in 1950 for the combined total employment of noncollectivized peasants, independant artisans, and other minor groups of the population was obtained by multiplying the percentage share of this category (2.0 percent in 1950, *Trud v SSSR*, 1968, p. 21; the percentage distribution given in the source related to civilian employment by economic activity) by the estimated absolute number of all persons employed in the national economy. The latter number was derived by dividing the 1950 annual average employment of workers and employees (40,420,000, *Nar. khoz. 1922–72*, p. 346) by the aggregate percentage share of 50.8 percent for workers and employees in the material production sphere (37.0 percent) and in the nonproductive sphere (13.8 percent), to obtain a total employment estimate of 79,567,000. Two caveats appertain to this estimate of total employment, and hence to the estimate of noncollectivized peasants, independent artisans, and other groups. First, it is probable that the 50.8 percent figure is based on full-time (man-year) equivalents which would be lower than that based on an annual average calculation. Nonetheless, the difference between the two concepts for workers and employees is believed to be minimal and that the estimate derived by the procedure used here is reasonable. Second, there is the question of whether the percentage for employment in the nonproductive sphere is inclusive of any collective farmers engaged in these types of activities (health, education, science, housing, etc.). It appears, however, that the effect of this ambiguity is also minimal inasmuch as only less than one-third of 1 percent (97,045 out of 33,047,126 collective farmers, given in TsSU, *Itogi*, 1962, pp. 104–105) are engaged in this sphere of work.

A 1958 combined employment estimate of 275,000 was derived in a similar manner, based on data in *Nar. khoz.* 59 . p. 584 and table 8.

It was then necessary to subtract estimates of noncollectivized, or individual peasant employment in 1950 and 1958 to obtain residual estimates of independent artisans and other minor groups of the population (henceforth referred to as independent artisans alone) in these years. Moreover, given the data available, the estimating procedure begins with 1958, the year to which the January 1959 census data relate.

An estimate of 78,000 noncollectivized peasants on an annual average basis was obtained by reducing the reported census labor force figure of 91,671 persons engaged in noncollectivized individual peasant agricultural activities by the ratio (0.847) of civilian socialized annual average employment (80,905,000 workers and employees plus collective farmers, see tables 8 and 11) to the civilian socialized labor force (95,507,000, TsSU, *Itogi*, 1962, p. 104). An estimate of 963,000 persons employed as individual, noncollectivized peasants in 1950 was derived on the basis of an index of noncollectivized households (1958=100) applied to the estimated 1958 employment. The number of such households is reported as 700,000 in 1950 (*Strana*, 1968, p. 116) and estimated at 56,700 in 1958. The 1958 estimate was derived by dividing the share of collectivized households (99.7 percent, *Sel'. khoz. SSSR*, 1960, p. 9) into the number of agricultural collective farm households (18.8 million, *Ibid.*, p. 56), and multiplying the resultant by 0.3 percent, the residual share of noncollectivized households.

1951–57, 1959–68: Interpolated linearly.

1969: Estimated by multiplying the reported combined population of 72,000 noncollectivized peasants and independent artisans in 1969 (Lagutin and Terent'yev, "Improve," 1972, p. 39) by the ratio (.461) of total reported civilian annual average employment (110,322,000 workers and employees, collective farmers, and private subsidiary agriculture, *Nar. khoz, 69*, pp. 420 and 530) to the 1969 total population (239,500,000. *Ibid.*, p. 7). The resultant estimated combined employment (33,192) was then reduced by the proportion of noncollectivized agricultural employment (34.4 percent, TsSU, *Itogi*, 1962, pp. 104–105) to obtain the estimated employment of independent artisans.

1970: Extrapolated on the basis of the annual change between 1958 and 1969.

Agricultural Sectors (line 14)

Sum of state (line 15), collective farm (line 16), and private (line 17) agriculture.

State (line 15)

1950–71: Column 2, table 8.
1972–75: Estimated in the manner described under industry (line 9), for the corresponding years.
1976–79: Interpolated linearly.
1980: Obtained by a least squares linear regression expressing the trend of the size of employment in state agriculture during the period 1966–75. (Y= −274,379 +144 X, where Y is employment in state agriculture and X is the calendar year.)

Collective Farm (line 16)

1950–71: Line 12, table 11.
1972–74: Interpolated linearly.
1975: Derived from Kostin, *Povysheniye*, 1971, p. 112.
1976–79: Interpolated linearly.
1980: Obtained by a least squares linear regression expressing the trend of the size of employment in collective farms during the period 1966–75. (Y=685,034— 339 X, where Y is employment in collective farms and X is the calendar year.)

Private (line 17)

1950–71: Estimates were made on the basis of 1958 labor inputs published by Gol'tsov in *Ekonomicheskiye nauki*, no. 1, 1961, pp. 46–7. These inputs, held constant throughout the series, when multiplied by the total number of sown hectares in the private sector and by the respective numbers of cattle, pigs, sheep, and goats tended, yield the number of man-days spent on these tasks for a year. The numbers of man-days were in turn converted to 280-day man-year equivalents. The estimates include noncollectivized peasantry. Data on sown acreage and livestock are given in the following sources:
1950, 1953–55, 1957–59; *Sel. khoz. SSSR*, v960, pp. 128–9, 266–9; *Nav. khoz.* 1956, p. 108; and *Nar. khoz. 56*, p. 114.
1951–52: Interpolated linearly.
1960–70: *Sel'. khoz. SSSR*, 1971, pp. 112–3, 246–9.
1971: *Nar. khoz. 1922–72*, p. 257.
1972–74, 1976–79: Interpolated linearly.
1975, 1980: Employment estimated by multiplying the sum of state agricultural and collective farm employment by the average ratio of the 1969–71 sums of state agricultural and collective farm employment to private agricultural employment.

Class of Worker (line 18)

Workers and Employees (line 19)

Sum of industry (line 9), other nonagricultural sectors (line 10), and state agriculture (line 15).

Collective Farmers (line 20)

Collective farm (line 16).

Private Agricultural Sector (line 21)

Private (line 17).

Independent Artisans (line 22)

Independent artisans (line 13).

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SCIENTIFIC AND ENGINEERING MANPOWER IN THE USSR AND EMPLOYMENT IN R&D

By DAVID W. BRONSON

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FIGURES

I. INTRODUCTION

Western attempts to quantify the inputs of men, money, and materials channeled into Soviet R&D have been frustrated by the paucity of data. In particular, the number of workers engaged in either civilian or military R&D is not reported. The USSR, however, does publish information that bears indirectly on the R&D effort, such as the number of workers with engineering degrees and the number of persons classified as "scientific workers." Some Westerners have accepted these data at face value as a measure of Soviet technical manpower and have used them to make US-Soviet comparisons. As a result, Soviet achievements and capabilities vis-a-vis the United States have been overstated.

Soviet statistics carefully used, however, do provide a basis for making estimates of the level and rate of growth of engineering and scientific manpower in R&D. Other Soviet data can be used to estimate total R&D employment (scientists, engineers, and support personnel) and, to some extent, the occupational structure of the R&D labor force. These estimates are perhaps the best available representation of trends in Soviet R&D, and they permit guarded comparisons of Soviet and US employment in R&D.

This article presents estimates of the size and trends of total Soviet engineering and scientific manpower and the share employed in R&D activities. In addition, US-Soviet comparisons in these areas of activity are presented. Finally, the qualitative and organizational aspects of Soviet R&D manpower are examined.

II. THE STOCK OF SCIENTIFIC AND ENGINEERING MANPOWER

Soviet leaders have long realized that natural scientists and engineers were critically important to the primary Soviet military and economic goals. High wages, preferential housing and other special privileges, and compulsory job assignments have been used to direct the best talent toward employment in research and development (R&D).[1] Ensuring an adequate supply of this talent has been a basic goal of the regimes' educational policy. Students receive early and comprehensive training in science and mathematics, and universities concentrate on turning out scientists and engineers.

[1] As a working definition for this article research and development is taken to include basic and applied research in science and engineering and the design and development of prototypes and processes. (Basic research is original investigation for the advancement of scientific knowledge; applied research is directed toward discovery of new scientific knowledge with specific product objectives; development is actively concerned with problems encountered in translating research findings or other general scientific knowledge into specific products.) The concept of R&D as used in this article also includes testing and evaluation, and thus is equivalent to the US concept of research, development, testing, and evaluation (RDT&E).

The supply of scientific and engineering manpower has grown enormously since 1950. At the same time, substantial changes have occurred in the occupational composition of this technical elite, reflecting shifts in demand since the mid-1950s, most notably for skills associated with R&D in the weapons and space sector. Although the forced pace of development of a technical elite has involved some diminution in training standards, the quality of Soviet training and the caliber of leading scientists in many fields is as good as in the West.

Natural Scientists

Since R&D draws overwhelmingly from the natural sciences (including mathematics) and from engineering fields, only these categories have been included in the discussion below. The Soviet Union does not publish data on the number of scientists as generally defined in the United States. The Soviet term "scientific workers" (*nauchnyye rabotniki*) is considerably broader in concept than the corresponding term used in the United States. Under the Soviet rubric, all employees with advanced degrees from universities, wherever employed, and all persons conducting research regardless of educational background, are counted as scientific workers. More rigorously defined, scientific workers include:

(*a*) academicians who are full or corresponding members of an Academy of Science;

(*b*) all persons who have an academic degree of doctor or candidate of science, or an academic title of professor, docent, research associate, or assistant regardless of the place or character of work; and

(*c*) other persons conducting research work in scientific institutions, industrial enterprises, and design organizations. The Soviet definition of "scientific workers," moreover, includes fields such as law and art that are not classified as "science" in the United States. [2]

Between 1950 and 1971, while the total civilian labor force was expanding by one-third, the number of natural scientists increased over 3 times, reflecting the relatively high priority given to scientific manpower. The rate of growth in the number of natural scientists rose markedly during the late 1950s and early 1960s, and then declined by about one-third in the period after 1966 (see Table 1). Within the natural sciences, the number of persons in the fields of physics and mathematics—essential in military/space research—has grown by more than 8 times since 1950. In contrast the number of agricultural scientists increased 1½ times during this period. As a consequence, physicists, mathematicians, and chemists as a share of all natural scientists rose from one-third in 1950 to one-half in 1971.

[2] For a complete list of occupations classified under science in the USSR, see Appendix B.

TABLE 1.—U.S.S.R.: DISTRIBUTION OF NATURAL SCIENTISTS,[1] BY FIELD[2]

[Thousand persons]

Year	Total natural scientists	Physicists and mathematicians[3]	Chemists	Biological scientists	Geologists and mineralogists	Agricultural scientists	Medical scientists
1950	70.9	10.2	12.9	8.6	3.6	14.1	21.5
1955	93.5	20.1	16.2	11.0	5.7	15.2	25.3
1958	112.5	22.6	20.2	13.2	8.2	18.6	29.7
1959	121.3	24.8	22.7	13.6	9.0	20.2	31.0
1960	134.4	29.0	26.2	15.1	10.7	21.2	32.2
1961	153.6	35.1	32.3	16.2	12.0	23.8	34.2
1962	167.7	48.3	[4] 25.4	[4] 21.6	13.4	25.5	33.5
1963	185.3	54.9	28.8	23.9	15.1	28.0	34.6
1964	195.1	58.2	31.6	25.7	15.4	29.1	35.1
1965	208.2	63.9	33.5	27.1	16.4	30.6	36.7
1966	225.8	70.8	36.7	29.8	17.5	31.7	39.3
1967	239.7	77.1	39.0	31.8	18.4	31.9	41.5
1968	256.0	83.0	41.7	34.1	19.3	33.3	44.6
1969	271.5	89.0	44.0	36.4	19.6	34.8	47.7
1970	284.1	95.3	45.8	37.3	20.3	35.4	50.0
1971	302.6	103.7	47.9	39.6	21.3	37.3	52.8

[1] Enumerated under "Scientific workers."
[2] Same sources as for line 5 of Table 12, in Appendix A.
[3] Including geophysicists.
[4] The sharp drop in chemists and large increase in biological scientists apparently resulted from the reclassification of biochemists. No announcement of the change or reasons for it was made. A number of smaller adjustments also have been made over the years, illustrating the state of flux of the Soviet manpower reporting system and increasing the risks when making comparisons over time.

Engineers

Soviet data on engineers (see Table 2) must be used cautiously, particularly when making comparisons with the United States. Soviet figures report the employment of persons with engineering degrees but overstate substantially the number of persons actually working as engineers. First, according to the 1959 census, about half of the employed persons with engineering degrees actually worked in managerial, administrative, or other non-engineering occupations. For example, Leonid Brezhnev holds a degree in metallurgical engineering and therefore is counted as an engineer in government and administrative institutions. Second, 10%–15% of the engineering categories in the USSR are not counted as such in the United States. Geodesy and cartography, for example, are considered engineering occupations in the USSR but not in the United States. Third, since the late 1950s the Soviet Union has greatly expanded part-time education. Perhaps one-third of all engineering graduates since 1960 have received abbreviated, below-standard instruction in this system. Such graduates would not be considered to be professionally trained engineers in the United States. Nevertheless, despite the incomparabilities, Soviet data are believed to show reasonably well the trends and areas of emphasis in allocating engineering manpower.

The pattern of growth of engineers resembles the growth of natural scientists: rapid growth since 1950 with the greatest increase in the

1955–63 period, followed by a marked slowdown in the late 1960s and early 1970s (see Table 3). Between 1955 and 1971 the number of employed persons with engineering degrees more than quadrupled. Although the number of engineers increased greatly in all sectors of the economy except agriculture, science and scientific service organizations were particularly favored. During 1956–70 the number of engineers employed in science and scientific services increased by 6 times. Between 1955 and 1970 the proportion of the engineers found in scientific institutions rose from about 15% to 25% of all engineers.

TABLE 2.—U.S.S.R.: DISTRIBUTION OF ENGINEERS, BY PLACE OF EMPLOYMENT[1]

[Thousand persons]

Year	Total	Industry and construction	Science and science service	Other[2]
1950	400.2	212.5	58.5	129.2
1955	597.8	319.8	89.4	188.6
1957	832.2	427.4	174.4	230.4
1960	1,135.0	600.1	264.4	270.5
1961	1,236.0	653.3	292.6	290.1
1962	1,325.1	687.2	324.3	313.6
1963	1,420.5	727.7	360.2	332.6
1964	1,497.5	753.4	391.2	352.9
1965	1,630.8	824.5	419.7	386.6
1966	1,789.0	897.4	469.2	422.4
1967	1,960.0	[3]	[3]	[3]
1968	2,168.0	[3]	[3]	[3]
1969	2,400.0	[3]	[3]	[3]
1970	2,486.5	1,282.9	617.8	585.8
1971	2,650.0	[3]	[3]	[3]

[1] 1950–66: "Trud v. S.S.S.R.," Moscow, 1968, p. 268–269. 1967: "Narodnoye khozyaystvo S.S.S.R. v. 1968 godu," Moscow, 1969, p. 175 (hereafter referred to as "N. kh."). 1968–69: "N. kh. 1969," p. 134. 1970: "Narodnoye obrazovaniye nauka i kul'tura v. S.S.S.R.," Moscow, 1971, p. 238. 1972: "N. kh. 1922–72," p. 95.

[2] Including agriculture, transportation, communication, education, and government administration.

[3] Not available.

TABLE 3.—UNITED STATES AND THE U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF SCIENCE AND ENGINEERING MANPOWER

[Percent]

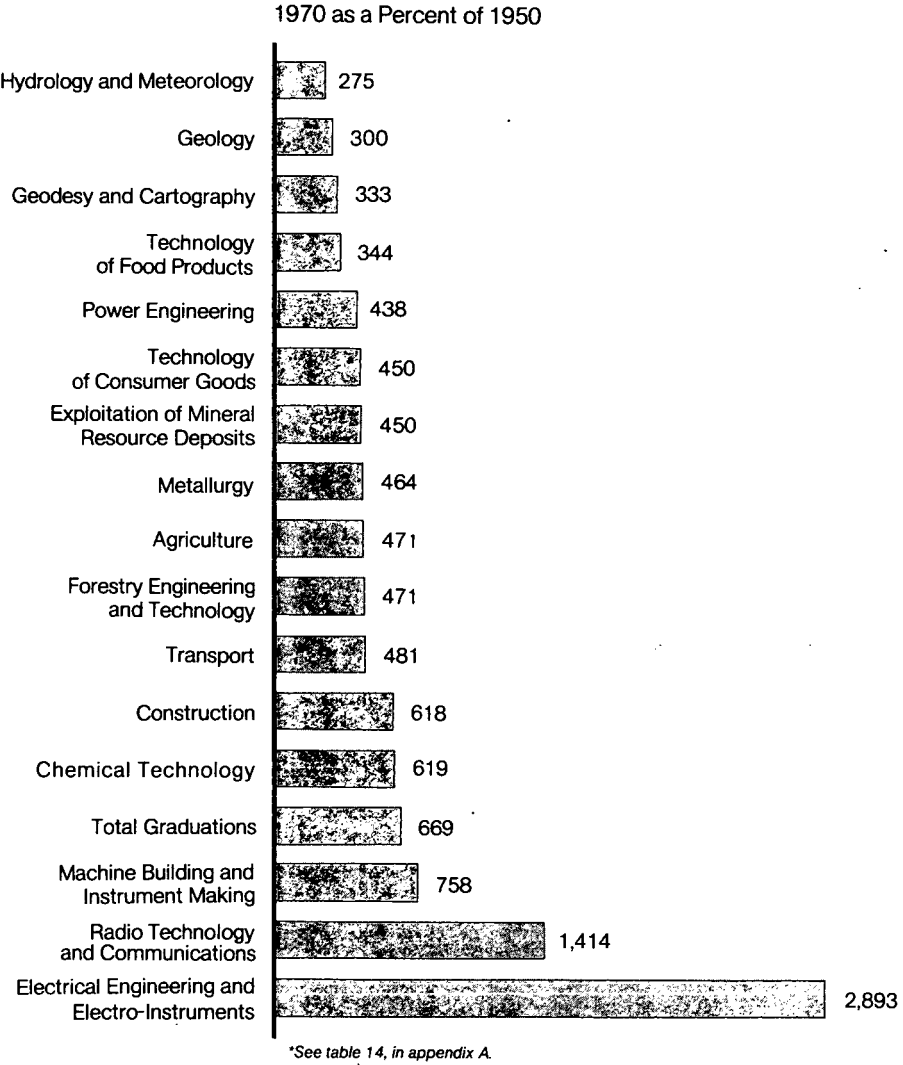
	Natural scientists		Engineers	
	United States	U.S.S.R.	United States	U.S.S.R.
1951 to 1955	7.3	5.7	8.1	8.4
1956 to 1963	6.9	8.9	5.5	11.4
1964 to 1971	7.9	6.3	2.3	8.1
1969 to 1971	[1]	5.7	[1]	6.9
1951 to 1971	7.4	7.2	4.9	9.4

[1] Not available.

The relative priorities attached to the various engineering specialties can be inferred from the data on the annual graduations shown in Figure 1. Primarily because of defense requirements, growth of engineering employment was most rapid in the fields of machine building and instrument making, electrical and electronic equipment, and radio technology, areas of specialization which are engaged heavily in the support of miltiary and space programs. In 1970, graduations in these fields were 5 to 28 times greater than in 1950. At the other end of the scale, graduations in the fields of geology and survey of mineral resources, hydrology and meteorology, geodesy and cartography, and food technology were only 2 times greater.

Figure 1

USSR: Annual Graduations of Engineers, by Field *



*See table 14, in appendix A.

US–USSR Comparisons

Conceptual differences in statistical reporting hinder meaningful, direct comparisons of natural scientists in the United States and USSR and prevent altogether comparisons of engineering employment. Because the definition of scientist and engineer is narrower in the United States than it is in the USSR, Soviet engineering and

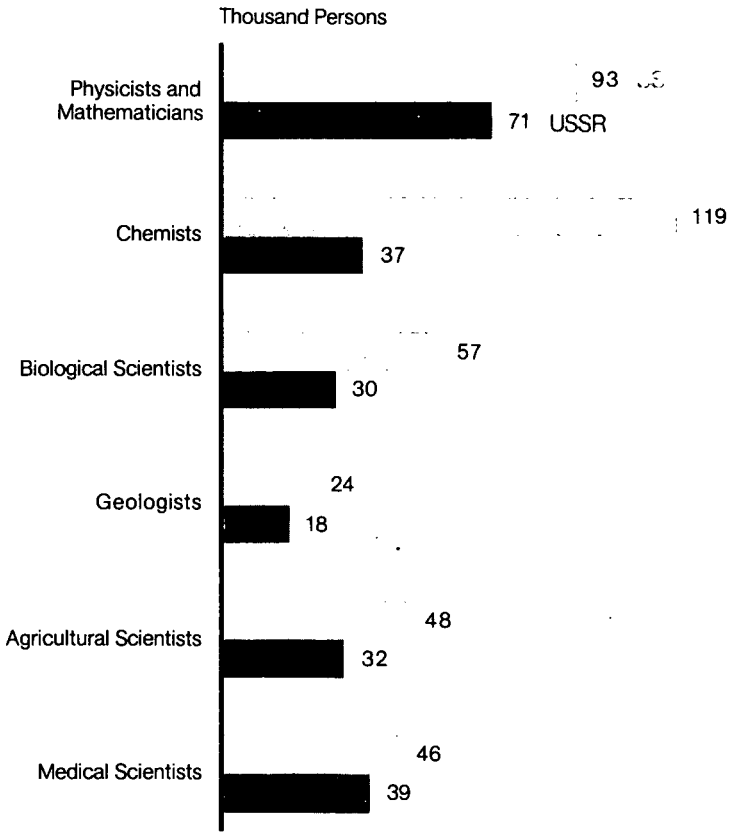
scientific manpower is overstated relative to that in the United States.[3] Bearing in mind the limitation imposed by the data, comparisons of scientific and engineering manpower in the two countries nevertheless provide some insight as to Soviet strengths and relative priorities.[4] The following points stand out when such comparisons are made:

(*a*) Between 1950 and 1971 the rate of growth in the number of natural scientists in the two countries was about the same.

(*b*) In 1966 the difference in the number of natural scientists in the two countries were most pronounced in chemistry and least in geology (see Figure 2).

Figure 2

United States and USSR: Comparison of Natural Scientists, 1966*



*See table 1, above, and table 15, in appendix A.

[3] In the United States, engineers represent all persons actually engaged in chemical, civil, electrical, mechanical, metallurgical, and all other types of engineering work at a level which requires knowledge of engineering, physical, life, or mathematical sciences equivalent at least to that acquired through completion of a four-year college course with a major in one of these fields. (An engineer need not hold a college degree in the field.)

Functionally, persons with the above qualifications are included if they are in research-development, production, management, technical service and sales, and other positions which require them to use the indicated level of knowledge in their work. Excluded are persons trained in engineering but currently employed in positions not requiring the use of such training.

[4] The number of persons in the United States employed in science and engineering positions is shown in Table 15, in Appendix A.

(*c*) Fluctuations in the rate of increase of scientists and engineers have been less pronounced in the United States than in the USSR, and the missile-space buildup in the late 1950s and early 1960s is not nearly as apparent in the United States as in the USSR. Since the 1950s the United States has witnessed a decline in the rate of growth of engineering manpower (see Table 3).

(*d*) The rate of growth of natural scientists in the United States has exceeded the rate of growth of engineers, while in the USSR, the reverse occurred.

(*e*) In 1950 there were more than twice as many natural scientists in the United States as in the USSR, and by 1971 the gap between the two countries had not narrowed. Nevertheless, the United States, which had about 3½ times as many physicists, mathematicians, and chemists as the Soviet Union in 1950, had only twice as many by 1966 (the last date for which US data are available), as shown in Table 1, above, and Table 15, in Appendix A.

(*f*) The rate of growth in the number of engineers in the United States between 1950 and 1971 has been only about one-half that recorded for the USSR during the same period.

III. The Allocation of Scientific and Engineering Manpower to the R&D Effort

The Soviet Official Series

Although the Soviet Union regularly reports the employment of persons with science or engineering degrees, some detective work is needed to determine how many of them are working in research and development.

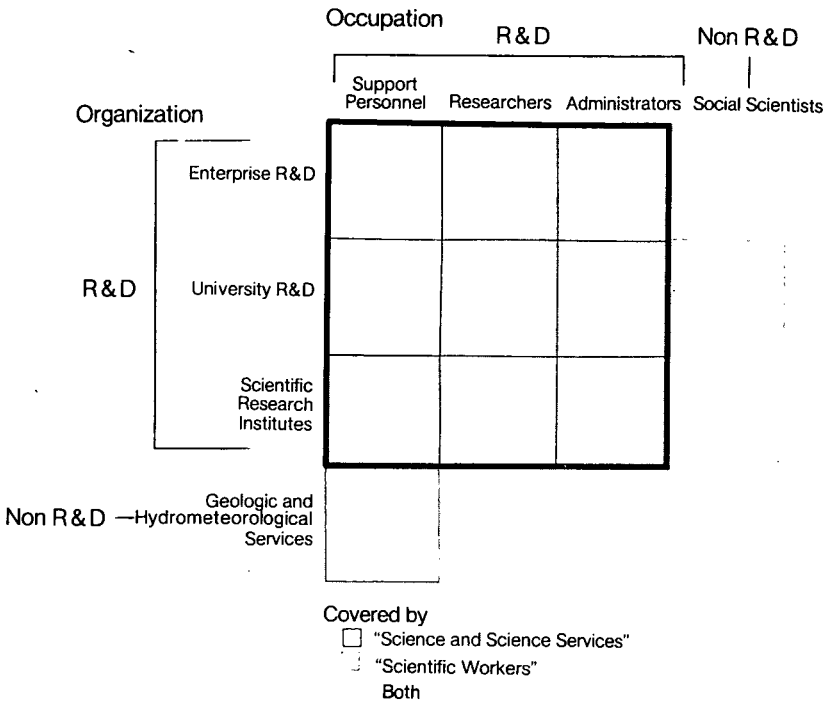
Two published series on employment—"science and science services" and "scientific workers"—together include most persons engaged in R&D, but they also contain many people not involved in R&D. The coverage of these two series is depicted in Figure 3. In terms of organizations included, the definition of "scientific workers" is broader because it counts the administrative and professional staffs employed in all of the institutions conducting R&D—scientific research organizations that are subordinate to ministries or the Academies of Sciences,[5] enterprises performing their own research, and universities. The series "science and science services," on the other hand, covers only persons employed in scientific research organizations but includes all of the people employed in these organizations—administrative staffs, researchers, and lesser-skilled support workers. Thus the two series overlap in that both include the administrative and professional staffs at scientific research organizations, and each fails to cover completely all persons actually engaged in R&D.[6]

[5] Including employment in the following main categories of organizations: (a) scientific research establishments (specifically, academies, institutes, observatories, archives, botanical gardens, museums, and libraries engaged in scientific work, and in addition, all computer centers); (b) surveying and geological exploration; (c) independent design organizations and selected experimental stations; (d) "establishments of the hydrometeorological service"; and (e) auxiliary establishments serving scientific organizations such as machine-testing stations (N. K. Sazanovich, ed.). *Metodicheskiye ukazaniya k sostavleniyv gosudarstvennogo plana razvitiya narodnogo khozyaystva SSSR*, Moscow, 1969, p. 757–759).

[6] Professional staff is defined to include researchers and technicians performing jobs requiring the equivalent of a college education; the nonprofessional staff includes clerical and other service workers performing tasks not requiring a college education.

Figure 3

Coverage of the Two Published Soviet Series on Science Employment



Incomplete coverage, however, is not the whole problem. Both series also report many persons who are not involved in R&D as it is usually defined. The "science and science services" category includes, for example, meteorologists assigned to weather forecasting, and holders of advanced degrees are counted as "scientific workers" whether they work in R&D or work full time in administration or university teaching.

Despite these limitations, the published employment series can be refined to provide reasonably accurate estimates of employment in Soviet R&D. These estimates describe a trend of the Soviet R&D effort that is different from either of the official series and from other independent estimates.

The estimates of Soviet R&D employment used here were derived through adjustments to the two published manpower series on science workers (as suggested in Figure 3) and by making estimates for those R&D workers not covered by either series. Briefly, employment in R&D was estimated as follows: First, persons who are included in the two series but who are not engaged in R&D were eliminated, workers in the geologic and hydrometeorological services were deleted from the "science and science services" series, and social scientists were

deleted from the "scientific worker" series. Second, estimates were made of R&D support personnel not included in either series. Summing the results of these procedures—avoiding double counting where it occurs—yields estimates of total R&D employment in the USSR.[7]

Trends in Employment in R&D in the USSR

During the past two decades, total employment in R&D in the USSR grew from an estimated 528,000 in 1950 to over 3.3 million in 1971 (see Table 4). This fivefold increase includes the employment of all those associated with R&D—researchers, administrators, laboratory technicians, clerical staff, char force, and others. As a share of the country's labor force, R&D employment rose from 0.5% to 2.6% between 1950 and 1971.

TABLE 4.—*U.S.S.R.: Employment in R&D*

Thousand persons:	
1950	528
1955	704
1960	1,458
1965	2,317
1971	3,335
Average annual percentage rate of growth:	
1951 to 1971	9.2
1951 to 1955	5.9
1956 to 1960	15.7
1961 to 1965	9.7
1966 to 1971	6.3

The rate of growth employment in R&D has fluctuated sharply since 1950. The tremendous rate of growth in total R&D employment between 1955 and 1962 supported the burgeoning aircraft, missile, and space programs. Since 1963 the rate of increase has returned to roughly the pre-1955 level. The more highly educated component of the R&D labor force did not grow at the same pace as all R&D manpower or even that part of it possessing the equivalent of a college education. Holders of advanced degrees increased very rapidly in 1951–55. (See Table 5). Then in 1956–62, the graduate schools could not keep up with the general expansion in R&D employment. As the graduate school enrollments climbed, however, the rate of increase of advanced degree holders employed in R&D made a marked recovery in 1963–71. Thus, considering quality, the rate of expansion of R&D manpower was somewhat slower before 1963 than indicated by total employment and faster after 1963.

TABLE 5.—U.S.S.R.: AVERAGE ANNUAL RATES OF GROWTH OF EMPLOYMENT IN R&D

[In percent]

Period	Total	Scientific workers		
		Nonprofessional staff	Total	With advanced degrees
1951 to 1955	5.9	6.0	5.5	10.4
1956 to 1962	15.4	15.8	13.8	7.3
1963 to 1971	6.3	6.0	7.8	9.7
1951 to 1971	9.2	9.2	9.2	9.0

[7] For details of methodology and for sources, see Table 12, in Appendix A.

The end result of these fall-behind and catchup phases of graduate education was probably some decline in the share of physicists, mathematicians, geologists, and biologists and an increase in the proportion of medical scientists having advanced degrees in R&D employment. At least this was true of the entire stock of natural scientists (see Table 6).

TABLE 6.—U.S.S.R.: ADVANCED DEGREE HOLDERS AS A SHARE OF NATURAL SCIENTISTS, BY FIELD

[In percent]

	1955	1962	1971	1955–71
				Net change
Physicists and mathematicians	30.8	20.7	27.7	−3.1
Chemists	32.0	32.2	33.6	1.6
Biological scientists	59.0	46.3	53.8	−5.2
Geologists and mineralogists	48.5	35.8	45.1	−3.4
Agricultural scientists	44.6	34.2	45.8	1.2
Medical scientists	60.1	55.4	68.8	8.7

Data from the "scientific workers" series indicate that, in 1950–60, about four-fifths of the college graduates associated with state "scientific research institutes" were actually conducting or managing research and development (see Table 7). Projecting this relationship forward and adding the scientific workers performing R&D at universities and industrial enterprises indicates that, in 1970, approximtately 494,000 of the 622,000 scientific workers employed in R&D were either performing research and development or managing R&D programs.[8]

TABLE 7.—U.S.S.R.: JOBS PERFORMED BY "SCIENTIFIC WORKERS" IN "SCIENTIFIC RESEARCH INSTITUTES" [1]

[Thousand persons]

	1950		1955		1960	
	Total	With advanced degrees	Total	With advanced degrees	Total	With advanced degrees
All jobs [2]	70.5	20.8	96.5	31.1	200.1	44.8
Administrators	20.2	8.9	22.1	10.8	40.9	16.7
Researchers	37.1	11.3	53.4	19.2	104.0	27.1
Other [3]	13.2	.6	21.0	1.1	55.2	1.0

[1] *Vysshеye obrazovaniye v. S.S.S.R.*, Moscow, 1961, p. 208–209. Data are from the "scientific workers" series.
[2] "Scientific research institutes" employ approximately ½ of all college graduates associated with R&D. College graduates are also employed in R&D activities at higher education institutions and at industrial enterprises.
[3] Including technicians and laboratory assistants.

Military Scientists

Of the scientists associated with R&D, military scientists deserve special mention. This group (classified as "other" scientists in Soviet statistics) includes scientists from various fields whose speciality is the application of their training to military requirements.[9] In 1950, about 98% of this group of 3,600 were teaching in military academies.

[8] In 1970, there were 128,000 scientific workers performing or managing R&D projects in industrial enterprises and 57,000 in universities. In addition, 10,000 graduate students performed R&D, and there were 427,000 scientific workers in scientific research institutes. Of these, it is estimated that 30% worked as technicians and laboratory assistants, leaving 299,000 scientific workers conducting or managing R&D projects.
[9] *Byulleten', ministerstva vysshego i srednegospetsial'nogo obrazovaniya SSSR*, no. 9, 1963, p. 8.

These academies train the professional in the armed forces who conduct military R&D and direct and supervise the design, development, and procurement of weapons and military equipment.[10] By 1962 the number of military scientists had doubled from the 1950 level, reaching 7,176.[11] In 1963 the number of military scientists was given as twice the 1962 level, without explanation.[12]; the category apparently was redefined that year to include military scientists heretofore not counted. Most likely, the additions include military scientists working in military research laboratories. Since 1963 the number of military scientists has grown at an average annual rate of 9.7%, compared with an average rate of 6.3% per year for all R&D employment.

Trends in the Allocation of R&D Manpower

Although bafflingly complex and shrouded in secrecy, Soviet R&D is carried on in roughly three areas: (a) specialized R&D institutes, design organizations, and experimental testing facilities (these are subordinate either to the Academies of Sciences or to government ministries), (b) higher education institutions, and (c) industrial enterprises.

The institutes and facilities subordinate to government ministries and the academies are the bedrock of the Soviet R&D effort, accounting for about 50% of the 5,307 science establishments in 1971,[13] and 87% of all R&D employment. In 1950 this sector of R&D accounted for one-third of the science establishments and 81% of R&D employment. The remaining R&D employment was found at enterprises and universities. R&D conducted by ministries is heavily weighted toward industry: About 40 of the nearly 60 Soviet ministries are industrial ministries which employed over 1.1 million R&D workers in 1968, or about one of every three persons engaged in R&D (see Table 8). If the R&D work force in industrial enterprises is lumped with the R&D employment in institutes subordinate to industrial ministries, total R&D employment associated with industry rises to about one-half of all R&D employment.

TABLE 8.—U.S.S.R.: R&D PERFORMED BY INDUSTRIAL MINISTRIES

	Number of R&D units			Employment (thousand persons)		
	1961	1965	1968	1961	1965	1968
Laboratories (research)	23,644	25,788	33,000	[1] 236.4	[1] 257.9	[1] 330.0
Design organizations (development)	11,227	13,378	15,000	[2] 120.2	148.5	223.0
Testing-experimental organizations (testing and evaluation)	(3)	(3)	(3)	[2] 397.4	434.0	573.1
Total industrial R&D (narrowly defined)[4]	(3)	(3)	(3)	754.0	840.4	1,126.1
Total industrial R&D (including enterprise R&D)[5]	(3)	(3)	(3)	883.0	996.4	1,372.1

[1] Estimate base on the number of employees and number of laboratories in several republics for several years.
[2] Data for 1960. B.F. Zaytsev and B.A. Lapin, Organizatsiya planirovaniya nauchno-teknicheskogo progressa, Moscow, 1970, p. 15.
[3] Not available.
[4] Excluding employment of persons in R&D activity if carried on in industrial enterprises on their own account.
[5] Including enterprise R&D from line 17 of Table 12, in Appendix A.

[10] Nicholas DeWitt, *Education and Professional Employment in the USSR*, Washington, 1961, p. 221.
[11] *N.kh.1962*, p. 583.
[12] *N.kh.1963*, p. 590.
[13] *N. kh. 1922–72*, p. 103.

Between 1961 and 1968, R&D employment in industrial ministries rose at an average annual rate of 5.9%. Unlike other areas of R&D, the growth of employment in industrial R&D performed by institutes subordinate to ministries was particularly rapid in the late 1960s, rising at an average rate of more than 10% from 1965 to 1968. At these institutes, approximately one-half of the R&D personnel were engaged in testing and evaluation work, 30% were in research, and the remaining 20% were in development.

Few data are available on employment in R&D by branch of industry. More specifically, no data are available on the magnitude of employment in defense-related R&D in industry. One Soviet source reveals that in 1968 industry employed nearly 426,000 "scientific workers" [14]—the highly trained segment of the R&D work force (see Table 9). Of this total, three out of four were employed in the machine building and metalworking branch (MBMW). Since MBMW employs one-third of the total industrial labor force and is responsible for about 30% of industrial production, its share of the R&D effort is disproportionately high. Moreover, military hardware constituted a substantial share of total MBMW output in the 1960s; therefore, much of the R&D labor force in this branch was undoubtedly working on military R&D. Ministries not related to industry—such as the ministries of Agriculture, Construction, Health, Education, Communications, Defense, and the like—also employ upwards of one-third of the total R&D work force in their research facilities.

TABLE 9.—U.S.S.R.: "SCIENTIFIC WORKERS" IN INDUSTRY [1]

	Persons	
	1965	1968
Total scientific workers in industry [2]	356, 810	425, 992
Of which:		
Machine building and metalworking	247, 625	302, 170
General machinery, instrument making, electrical-technical, and radio-electronics	73, 293	(3)
Chemicals	50, 791	62, 096

[1] Based on N. B. Vornin (ed), Ekonomicheskiye problemy effektivnosti nauki, Moscow, 1971, pp. 77, 79.
[2] Employed in the various categories of industrial R&D shown in table 8.
[3] Not available.

Next in importance is employment of over 90,000 scientists in 20 academies of science, the most prestigious science institutions in the country.[15] These academies, the oldest of which was established in 1725, are engaged primarily in basic research and have no counterpart in the United States. In the USSR Academy of Sciences, in 1965, there were 4,978 scientists in the physical-technical and mathematical sciences departments supported by 12,560 auxiliary workers. In the chemical and biological sciences departments there were 5,132 scientists and 11,361 auxiliary workers.[16]

[14] These workers are scattered among the various categories of industrial R&D employment shown in Table 8.
[15] *N. Kh. 1922–72*, p. 106.
[16] D. I. Valenty and I. F. Sorokin (eds), *Nascleniye trudovyye resursy SSSR*, Moscow, 1971, p. 284.

R&D performed at universities is not nearly as important in the USSR as it is in the United States. In 1971, Soviet universities accounted for only 2% of the total R&D work force, compared with about 10% in the United States. There are 51 research institutes located in Soviet universities, but these are either small scientific organizations or institutes operating on a volunteer basis.[17] University research has been characterized by one Soviet source as being "performed by the academic departments' instructors during the so-called 'second half of the working day.' Research departments and sectors play a purely administrative and managerial role. It is not surprising that many years of attempts to conduct integrated research using the forces of a group of departments have produced virtually nothing." [18]

Occupational Structure of R&D Employment

The Soviet policy of maintaining a high degree of central control is evident in the organizational structure of R&D, as the most important R&D is performed not at the production level (enterprises) but rather at the administrative level (ministries). The highly formal structure of R&D is carried down to the occupational level with duties and responsibilities carefully spelled out (see Appendix C).

Both Soviet and Western experts have stressed the importance of having a proper mixture of administrators, researchers, technicians, and auxiliary workers in achieving a productive research program. Data on the stucture of employment in R&D in both the United States and USSR are sketchy. In 1970, there were approximately 494,000 scientists and engineers conducting or managing R&D programs in the Soviet Union, supported by about 2½ million other workers. In contrast, the United States had approximately 545,000 researchers (scientists and engineers) supported by about 700,000 other workers in 1970 (see Figure 4).

The abundance of support personnel, however, masks a severe shortage of professionally trained technicians. A series of surveys of research institutes subordinate to the Ministry of Instrument Making, while perhaps atypical, provides some insight into the structure of employment in R&D. Approximately one-half of the Staffs of the institutes was composed of workers classified as engineering technical personnel and divided by occupation as follows: [19]

Occupation:	*Percent of engineering-technical staff*
Researcher	56.2
Designer	25.6
Technologist [1]	5.0
Supply and service personnel	13.2

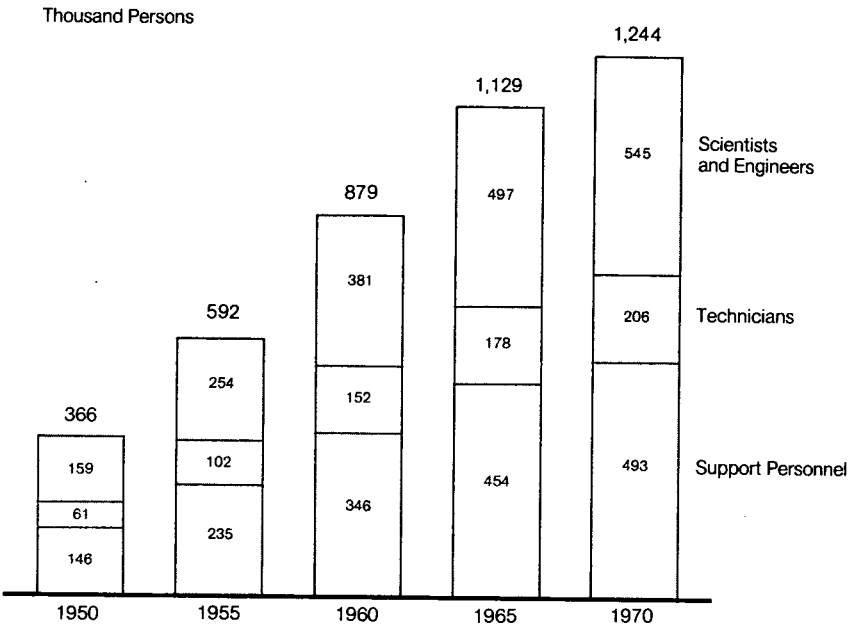
[1] Technologists are responsible for translating blueprints and technical documents into production models.

Thus, in these institutes, the researchers constituted about one-fourth of the entire staff, and the ratio of researchers to support personnel was approximately 1 to 3.

[17] *Izvestiya*, 22 January 1972, p. 5.
[18] *Ibid.*
[19] P. N. Zavlin, A. I. Shcherbakov, and M. A. Yudelevich, *Trud v sfere nauki*, Novosibirsk, 1971, p. 319.

Figure 4

United States: R & D Employment, by Occupational Category*



*See table 13, in appendix A. Because of rounding, components may not add to the totals shown.

Soviet experts argue that shortages of technicians, the skilled workers who perform routine technical jobs that otherwise must be done by researchers, foster inefficiencies in R&D. From scattered data, it appears that the ratio of researchers to technicians is not more than 1 to 0.3, compared with the ratio of 1 to 1.5 or 1 to 2 that is deemed optimal by a Soviet expert.[20] Moreover, this expert claims that the majority of Soviet research labs employ only one-fifth as many technicians as analogous labs in the United States, Switzerland, and West Germany.[21] Workers in prototype construction are also fewer than desired and average less than one for every five researchers, compared with the goal of one per four to five researchers.

Surprisingly enough, the Soviets also assert that they are short of unskilled and semi-skilled workers in R&D. The results of a study of 66 laboratories in instrument making research institutes (see Table 10) indicated shortages of workers ranging from one-half to three-quarters of recommended levels.

Some design work is performed within research institutes. Five to six percent of the workers in the surveyed research institutes were designers.[22] The majority of design work, however, is carried out by separate design organizations which are responsible only for design and development work. Design bureaus account for approximately one-fifth of total R&D employment by industrial ministries (see Table 8). As in research labs, there are serious shortages of technicians in

[20] *Ibid.*, p. 304.
[21] *Ibid.*, p. 303–304.
[22] *Ibid.*, p. 323.

design bureaus, and the situation worsened during the early and mid-1960s (see Table 11). In 1966, there were 0.7 technicians per engineer in design organizations compared with a recommended ratio of 3.4 technicians per engineer.[23]

TABLE 10.—ACTUAL AND RECOMMENDED STAFF POSITIONS IN LABORATORIES OF THE RESEARCH INSTITUTES OF THE SOVIET MINISTRY OF INSTRUMENT MAKING[1]

[Persons]

Position	Actual	Recommended
Director of laboratory	1.0	1
Deputy director of laboratory	0	1
Head engineer	2.5	2 to 3
Senior engineer	4.5	4 to 5
Engineer	7.5	8 to 10
Technician	4.5	15 to 20
Auxiliary worker (lab assistants, secretaries, etc.)	0.2	2 to 3
Total	20.0	35 to 45

[1] Ibid., p. 306.

One-half of the R&D employment in industrial ministries is in testing-evaluation organizations (see Table 8). The responsibilities of these organizations and the composition of their staffs are not known.

Soviet progress in R&D has been retarded by numerous factors, including shortages of laboratories and equipment and enterprise managers who have tended to resist innovations because of the nature of the incentives set for them by the central authorities. Even if these faults were corrected, however, the organization and structure of Soviet R&D would remain a major defect. According to Soviet reports, the artificial organizational separation of establishments performing research, design, and testing, and particularly the limited amount of R&D performed by industrial enterprises, results in bottlenecks and failures of coordination.

TABLE 11.—U.S.S.R.: STAFF POSITIONS IN DESIGN BUREAUS AS A SHARE OF TOTAL PROFESSIONAL EMPLOYMENT

[Percent]

Position	1963	1966
Administrator	1.3	1.9
Head designer	7.3	9.8
Senior engineer	12.9	18.8
Engineer	23.3	28.1
Senior technician	27.3	24.1
Technican	19.6	14.3
Draftsman	8.3	3.0
Total	100.0	100.0
Ratio of engineers to technicians	1:1.2	1:0.7

[1] Ibid., p. 327.

One aspect of the organizational problem involves the misallocation of R&D manpower. Forty percent of all advanced degree holders are employed by universities, but they account for only 4% of science research.[24] In large part, R&D in Soviet universities is starved for equipment and materials. In 1965, expenditures per R&D worker in

[23] *Ibid.*, p. 326.
[24] *Izvestiya*, 22 January 1972, p. 5.

universities for these items was only one-fourth the amount spent in research institutes.[25] A 1966 decree ordered that the situation be corrected, but reportedly nothing yet has been accomplished.[26] Ministerial research institutes, on the other hand, have relatively large amounts of equipment and materials but are short of people with advanced degrees or even with a university education: in 1966 only 43% of their professionals (administrators and researchers) had a higher education.[27]

Although universities and ministerial research institutes have their problems, the enterprise research institute, which lacks both men and money, is in the worst shape of all Soviet R&D elements. Through at least the late 1950s and early 1960s, moreover, the situation at enterprise laboratories deteriorated as the higher paying scientific research institutes attracted qualified personnel employed in industry. (Between 1960 and 1966 the share of engineers with a higher education employed in industry laboratories declined from 15.8% to 14.6%.)[28] Between 1955 and 1966 the average number of people employed in the design and research labs at enterprises declined from 24 to 17 and the number of university trained engineers, from 10 to 6.[29]

US–USSR Comparisons

As long ago as 1950 the number of persons working in Soviet R&D was half again as large as the number working in R&D in the United States (see Figure 5). During 1951–70 the USSR enlarged its R&D labor force at a substantially greater rate than did the United States—9.2% per year compared with 6.3% per year. As a consequence, total R&D employment in the USSR grew to more than 2½ times the US level by 1970. The Soviet commitment to R&D can also be traced in the rising share of the labor force engaged in R&D, which increased from 0.5% in 1950 to 2.6% in 1970. In the United States R&D employment accounted for 0.6% of the labor force in 1950 and 1.4% in 1970.

There is, however, no Soviet advantage in the number of scientists and engineers conducting or managing R&D projects; according to the estimates presented above, the USSR had 494,000 of these people in 1970 while the United States had 545,000.

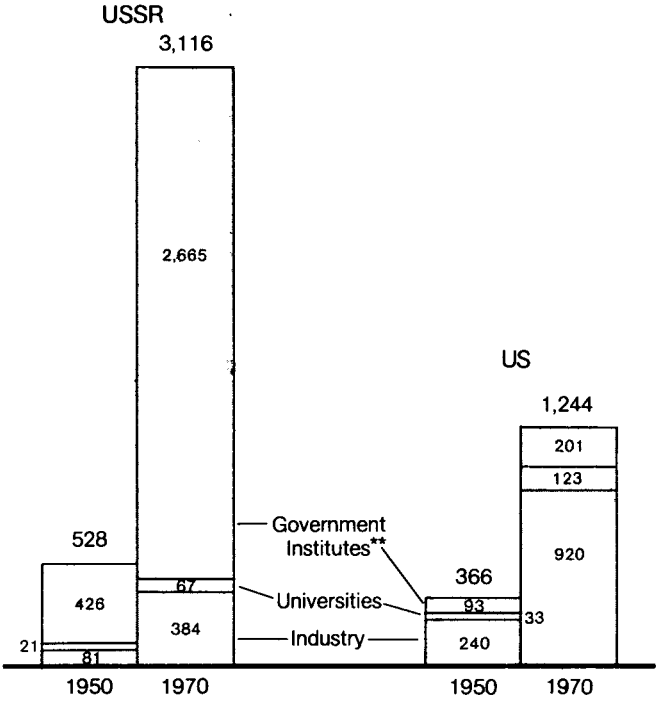
In addition, the organization and structure of Soviet R&D prevents the USSR from making the most of its manpower. The lack of attentention paid to enterprise research in the USSR has hindered technological development. Only 12% of R&D workers are employed in industrial enterprises, a situation very different from that in the United States[30] (see Figure 5). On the one hand, plants facing day-to-day problems with production are best able to see problems and opportunities. With little or no R&D capabilities, however, these plants must rely on outside help. On the other hand, research institutes, unfamiliar with the capabilities and problems of the plants they

[25] Zavlin, Shcherbakov, and Yudelevich, *op. cit.* p. 58.
[26] *Ibid.*
[27] *Voprosy ekonomiki i planirovaniya nauchnykh issledovaniy*, Moscow, 1968, p. 69. (Translated by US Air Force, Foreign Technology Division, FTD–MT–24–195–69.)
[28] Zavlin, Shcherbakov, and Yudelevich, *op. cit.*, p. 59.
[29] *Ekonomika i organizatisya promyshlennogo proizvodstva*, No. 4, 1971.
[30] In terms of quality, the share may be even smaller because a wage differential of 20%–40% draws the better researchers out of industry and into higher-paying institutes. (*Pravda*, 15 January 1972, p. 3.)

Figure 5

United States and USSR: Employment in R & D, by Type of Organization*

Thousand Persons



*See tables 12 and 13, in appendix A.

**In the United States, government institutes include federal government and other nonprofit institutions. The latter group employed 6,500 people in 1950 and 40,500 in 1970.

serve, tend to develop solutions that cannot be implemented. For example, "up to 40% of the plant designers are occupied in the unproductive work of correcting projects developed by research institutes that do not meet the plant's production capabilities." [31] As a result, the average time from research to production in Soviet industry is five to ten years, whereas more than 90% of the research projects in US industry are completed in less than five years.[32]

Although the people concerned with Soviet R&D have long recognized the importance of beefing up enterprise R&D, not much has been done in this area. A comparison of the growth of employment in major organizational components of R&D shows a sharply contrasting development in the United States and the USSR. In the USSR, employment in government institutes ("scientific research institutes") grew much faster during 1951–70 than employment in R&D at enterprises. In the United States, however, growth of R&D employment in government was only about two-fifths that in enterprises.

[31] *Voprosy ekonomiki i planirovaniya nauchnykh issledovaniy,* op. cit. p. 13.
[32] Zavlin, Shcherbakov, and Yudelevich, *op. cit.* p. 133–134.

The USSR's R&D effort during the past two decades has resulted in technological progress matching the progress of the developed West in most areas. In making these gains, however, the USSR has had to employ substantially more R&D workers than the West, even though it enjoyed the advantage of borrowing from the more advanced West. This relative inefficiency stems from the factors discussed above and other factors outside the sphere of R&D related to the organization and management of the economy.

Comparison with Other Estimates

Few estimates have been made by Westerners of the overall employment in Soviet R&D. The most comprehensive effort was done in 1969 by the Organization for Economic Cooperation and Development (OECD) when it published estimates for total Soviet R&D employment in 1957, 1962, and 1965–66.[33] Most frequently, the Soviet official series on employment in "science and science services" has been used as a surrogate for R&D employment. This series, as noted earlier, includes many persons not working in R&D who should be excluded from an R&D estimate, and some persons who are engaged in R&D are not included in the series. The net result is that the Soviet official series grossly overstates R&D employment in the 1950s and continues to the present time to overstate R&D employment but to a lesser degree (see Figure 6).

The OECD estimate of R&D employment and the estimate used in this article (labeled "New" in figure 6) are similar in that they are based on the Soviet official series for "science and science services" and attempt to net out non-R&D related employment and add in estimates for R&D employment not covered in the official series. The estimates differ primarily in assumptions made and sources used to make estimates of R&D workers not counted in the official series. The most significant differences between the OECD and the New estimate are as follows:

(*a*) OECD does not exclude social scientists from the "scientific worker" category, whereas the estimate used in this report excludes social scientists.

(*b*) After deducting geologic and hydrometeorological services from the "science and science services" category, OECD subtracts, alternatively, an additional 20% and 40% of the remaining workers as not being engaged in R&D activity. This is the basis for OECD's low and high estimate of R&D employment and trends to offset the failure to delete social scientists.

(*c*) OECD does not adjust data for the Soviet redefinition in 1962 that added about 30,000 workers to the Soviet R&D rolls. The New estimate adjusts Soviet data before 1962 to account for these unregistered R&D workers.

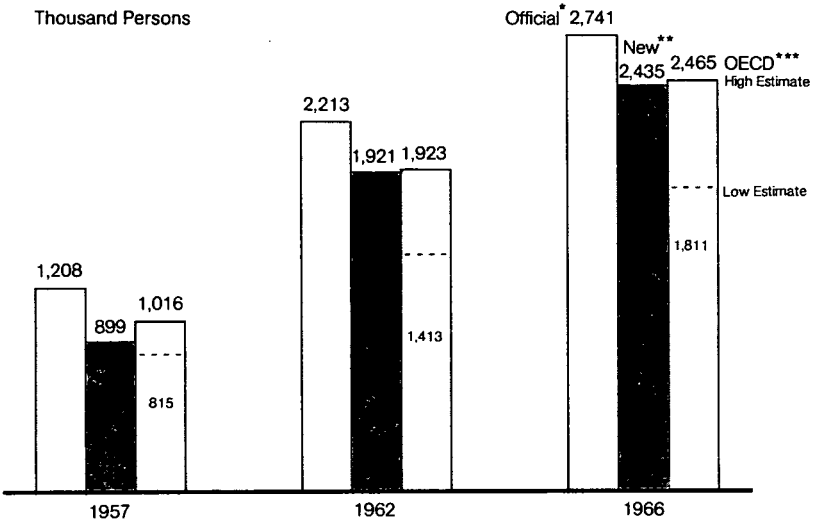
[33] E. Zaleski, J. P. Kozlowski, N. Wienert, R. W. Davies, M. J. Berry, and R. Amann, *Science Policy in the USSR*, Paris, 1969, p. 501–534.

Figure 6

Comparison of Estimates of Employment in Soviet R&D

Average Annual Rate of Growth (Percent)

	1958-66	1958-62	1963-66
Official*	9.5	12.9	5.5
New**	11.7	16.4	6.1
OECD***	9.9	12.8	6.4



*Employment in Science and Science Services: N. Kh. 1963, p. 476; N. Kh. 1958, p. 659; N. Kh. 1968, p. 541.
**See line 20 of table 12, in appendix A.
***OECD, Science Policy in the USSR, Paris, 1969, p. 502.

Appendix A

Estimates of Employment in U.S. and Soviet R&D Activity, 1950–71

Neither the United States nor the USSR publish data on total employment in R&D activity. Other data, however, are published that allow the construction of such estimates. Although the series for the two countries were made as comparable as possible, the wide differences in reporting in the two countries and ambiguities in Soviet reporting require caution in making direct comparisons. In particular, a number of persons are included on Soviet R&D rolls who are not counted in the United States. It is suspected, therefore, that the estimate for total employment in Soviet R&D may be significanly inflated when compared with the estimate for the United States. On the other hand, it is believed that the two series do reflect with considerable accuracy the trends in R&D activity in the United States and USSR between 1950 and 1971.

The estimates of total Soviet R&D manpower shown in Table 12 were derived through adjustments to the two published manpower series on scientific workers (see Figure 3). Briefly, the estimates were derived as follows. First, employment in geologic-prospecting and hydrometeorological services was deducted from total "science and science services" employment category. Second, social scientists were deducted from the "scientific worker" category. Third, the number of scientific workers at academic institutions is reported, but only part of their time is spent in R&D activity. Soviet sources indicate that all persons in research in higher education establishments should, for purposes of accounting, be counted as only one-third. This coefficient was used to derive the estimate for academic research. Finally, estimates were made for the number of persons engaged in R&D activities in industrial enterprises. In sum, the estimate includes (1) all persons employed at scientific research institutes (less geologic and hydrometeorological organizations and social scientists) and project and design organizations and (2) an estimate of full-time equivalent research being conducted at higher educational institutions and at enterprises.

Data on the number of scientists and engineers engaged in R&D activity in the United States, by sector, are published for selected years between 1950 and 1971 (see Table 13). Estimates were made of the number of technicians and other support personnel by David W. Carey in order to make the US data comparable with Soviet data.

Tables 14 and 15 present detailed data that bear on the R&D effort in the two countries. All data in the two tables are from official government sources in the United States and USSR. As discussed in the text, differences in definitions and coverage made it impossible to compare data directly on engineers in the two countries.

TABLE 12.—U.S.S.R.: EMPLOYMENT IN R. & D.

[In thousands of persons]

Line No.		1950	1955	1956	1957	1958	1959	1960	1961	1962
1	Total science and science services employment	714	992	1,094	1,208	1,326	1,462	1,763	2,011	2,213
2	Geologic and hydrometeorological services	277	298	421	427	445	440	436	427	434
3	Employment at scientific research institutes	437	594	673	781	881	1,022	1,327	1,584	1,779
4	Total scientific workers	163	224	240	262	284	310	354	404	525
5	Social scientists	46	62	66	68	72	75	83	93	110
6	Natural scientists, military scientists, and engineers	117	162	174	194	212	235	271	311	415
7	With advanced degrees	37	62	66	71	75	79	82	86	90
8	Total scientific workers at research institutes	71	97	106	122	141	165	200	239	299
9	Social scientists	11	18	20	21	23	25	28	33	40
10	Natural scientists, military scientists, and engineers	60	79	86	101	118	140	172	206	259
11	Total scientific workers at universities	87	119	125	132	136	138	147	158	180
12	Social scientists	35	44	46	47	49	50	55	60	70
13	Natural scientists, military scientists, and engineers	52	75	79	85	87	88	92	98	110
14	Performing R&D	17	25	26	28	29	29	31	33	37
15	Total scientific workers at enterprises	27	33	35	36	38	39	41	43	46
16	Support workers assisting R&D in enterprises	54	66	70	72	76	78	82	86	92
17	Total R&D employment in industry	81	99	105	108	114	117	123	129	138
18	Full-time graduate students at R&D institutes	7	8	7	6	7	8	10	11	14
19	Graduate students performing R&D	4	4	4	3	4	4	5	6	7
20	Total R&D employment	528	704	788	899	1,005	1,147	1,458	1,719	1,921
21	Scientific workers	108	141	151	168	189	212	249	288	349
22	Scientific workers with advanced degrees	25	41	44	48	53	58	62	67	67

TABLE 12.—U.S.S.R. : Employment in R. & D.—Continued

[In thousands of persons]

Line No.		1963	1964	1965	1966	1967	1968	1969	1970	1971
1	Total science and science services employment	2,370	2,497	2,625	2,741	2,850	2,990	3,128	3,238	3,374
2	Geologic and hydrometeorological services	453	465	465	467	470	475	479	484	489
3	Employment at scientific research institutes	1,917	2,032	2,160	2,274	2,380	2,515	2,649	2,754	2,885
4	Total scientific workers	566	612	665	712	770	823	883	928	1,003
5	Social scientists	119	130	138	153	166	178	192	203	217
6	Natural scientists, military scientists, and engineers	447	482	527	559	604	645	691	725	786
7	With advanced degrees	97	104	113	129	144	159	175	192	214
8	Total scientific workers at research institutes	327	357	390	397	428	457	487	516	558
9	Social scientists	44	49	54	61	68	75	83	89	97
10	Natural scientists, military scientists and engineers	283	308	336	336	360	382	404	427	461
11	Total scientific workers at universities	197	208	222	264	284	284	284	284	284
12	Social scientists	75	81	84	92	98	103	109	114	120
13	Natural scientists, military scientists, and engineers	122	127	138	172	186	181	175	170	164
14	Performing R&D	41	42	46	57	62	60	58	57	55
15	Total scientific workers at enterprises	42	49	52	52	58	82	113	128	161
16	Support workers assisting R&D in enterprises	84	98	104	104	116	164	226	256	322
17	Total R&D employment in industry	126	147	156	156	174	246	339	384	483
18	Full-time graduate students at R&D institutes	15	17	18	18	19	19	19	19	18
19	Graduate students performing R&D	8	8	9	9	10	10	10	10	9
20	Total R&D employment	2,048	2,179	2,317	2,435	2,558	2,756	2,973	3,116	3,335
21	Scientific workers	374	406	443	454	490	534	585	622	686
22	Scientific workers with advanced degrees	73	79	86	94	105	116	126	139	154

SOURCES AND METHODOLOGY

Line 1: 1950–58—"N.Kh. 1958," p. 658–59. 1959—"N.Kh. 1959," p. 589. 1960–66—"Trud v S.S.S.R.," Moscow, 1968, p. 24–25. 1967–68—"N.Kh. 1968," p. 549. 1969–70—"N.Kh. 1970," p. 511. 1971—"N.Kh. 1922–72," p. 347.

Line 2: 1950–58—"N.Kh. 1958," p. 658–59. 1959—Interpolated. 1960–67—"Trud v S.S.S.R., op. cit.," p. 24–25. 1968–71—During 1963–67 the rate of increase was 1 percent. It is assumed that this rate was maintained during 1968–71.

Line 3: 1950–71—Line 1 minus line 2.

Line 4: 1950–58—"N.Kh. 1958," p. 843. 1959–62—"N.Kh. 1962," p. 582. 1963–64—"N.Kh. 1964," p. 699. 1965–67—"Trud v. S.S.S.R., op. cit.," p. 247. 1968—"N.Kh. 1969," p. 694. 1969–70—"N.Kh. 1970," p. 656. 1971—"N.Kh. 1922–72," p. 103.

Line 5: Social scientists include historicans, philosophers, economists, philologists, geographers, jurists, pedagogists, artists, architects, and psychologists. 1950—"Vyssheve obrazovaniye v S.S.S.R.," Moscow, 1961, p. 204. 1955–57—Interpolated. 1958—"N.Kh. 1958," p. 845. 1959—"N.Kh. 1959," p. 756. 1960—"N.Kh. 1960," p. 784. 1961—"N.Kh. 1961," p. 703. 1962—"N.Kh. 1962," p. 583. 1963—"N.Kh. 1963," p. 590. 1964—"N.Kh. 1964", p. 700. 1965—"N.Kh. 1965," p. 710. 1966—"Trud v S.S.S.R., op. cit.," p. 248. 1967—"N.Kh. 1967," p. 810. 1968—"N.Kh. 1968," p. 696. 1969—"N.Kh 1969," p. 695. 1970—"N.Kh. 1970," p. 657. 1971—"N.Kh. 1971," p. 104.

Line 6: Natural scientists include physicists, mathematicians, chemists, biologists, geologists, agronomists, veterinarians, medical and pharmaceutical researchers, and research engineers. 1950–71—Line 4 minus line 5.

Line 7: 1950—"Vestnik statistiki," No. 4, 1962, p. 66 and "N.Kh. 1960," p. 784. 1951–71—Sources same as line 5.

Line 8: 1950, 58, 60, 64–65—"N.Kh. 1965," p. 709. 1955, 59—"N.Kh. 1960," p. 782. 1956–57—"N.Kh. 1959," p. 754. 1961—"N.Kh. 1962", p. 582. 1962–63—"N.Kh. 1963," p. 589. 1966—"Ekonomicheskiye problemy effektivnosti nauki," Moscow, 1971, p. 214. 1967—A. A. Zyagin and V. N. Mosin, "Planirovaniye truda i zarabotnoy platy v NII i KB," Moscow, 1969, p. 3 reports combined employment in NII and VUZy. V. P. Yelyutin (ed) "Vysshaya shkola S.S.S.R. za 50 let," Moscow, 1967, p. 144, reports 263.2 thousand science workers at VUZy in 1967. 1968–69—Interpolated. 1970—Zyagin and Mosin, op. cit. minus 263,000 assumed to be at universities. 1971—It is assumed that the share of total "scientific workers" at research institutes was the same as in 1970.

Line 9: 1950, 60—"Vyssheve obrazovaniye, op. cit.", p. 204. 1955–59, 61–71—The share of "scientific workers" in the social sciences employed in scientific research institutes increased from 23.9 percent in 1950 to 33.7 percent in 1960 (line 9 as a percent of line 6). It is assumed that the increase occurred at 1 percentage point per year during the 1950's and continued at that rate to 1971. The shares are applied to the number of social scientists reported in line 5.

Line 10: 1950–71—Line 8 minus line 9.

Line 11: 1950–67—Sources same as line 8. 1968–71—Assumed to remain at 1967 level.

Line 12: 1950–71—Line 5 minus line 9.

Line 13: 1950–51—Line 11 minus line 12.

Line 14: 1950–71—Reportedly, about one-third of the time of Soviet scientists employed by universities is spent performing research. N. A. Chinakal et. al. (eds) "Puti povysheniya effektivnosti nauchogo truda," Novosibirsk, 1966, p. 81. Line 14 is 33.3 percent of line 13.

Line 15: 1950–61—Beginning in 1962 the definition of "scientific worker was adjusted to include technicians without a graduate degree carrying out scientific work at industrial enterprises and in project-design organizations. To the data reported for 1950–61, which is derived as a residual (see line 8 and line 11) was added an estimate for the reported category. It is assumed that the rate of growth for this category during 1962–65 (4.4 percent per year), prevailed during 1950–61. 1962–71—Derived as a residual; total scientific workers minus those employed in research institutes and universities.

Line 16: 1950–71—Arbitrarily assumed to be twice line 15.

Line 17: 1950–71—The sum of line 15 and line 16.

Line 18: 1950, 1960, 1965, 1969–70—"N.Kh. 1970," p. 661. 1955—"N.Kh. 1958," p. 848, adjusted. 1956–59—"N.Kh. 1959," p. 760. 1961—"N.Kh. 1961," p. 707. 1962–63—"N.Kh. 1963," p. 595. 1964—"N.K. 1965," p. 715. 1966–68—"N.Kh. 1968," p. 700. 1971—"N.Kh. 1922–72," p. 107.

Line 19: 1950–71—Arbitrarily assumed to be one-half of line 18.

Line 20: 1950–71—Line 3 plus lines 14, 17, and 19 less line 9.

Line 21: 1950–71—The sum of lines 10, 14, 15, and 19.

Line 22: 1950–71—It is assumed that the proportion of all natural scientists, military scientists, and engineers with advanced degrees (line 7) working in scientific research institutes is the same as the proportion of natural scientists, military scientists, and engineers—irrespective of degree held (line 10)—to the total number of natural scientists, military scientists, and engineers (line 6). It is assumed further that those natural scientists with advanced degrees not employed in scientific research institutes are employed at universities and spend one-third of their time engaged in R&D Thus, line 22, is obtained by the following formula:

$$\text{Line 22} = \frac{\text{line 10}}{\text{line 6}}\,(\text{line 7}) + 0.33\left[\text{line 7} - \frac{\text{line 10}}{\text{line 6}}\,(\text{line 7})\right]$$

TABLE 13.—UNITED STATES: EMPLOYMENT IN R&D [1]

[Thousand persons]

Line No.		1950	1955	1958	1960	1965	1970	1971
1	Federal Government	86.7	102.4	106.0	96.1	147.7	160.5	157.5
2	Scientists and engineers	37.7	44.5	46.1	41.8	64.2	69.8	68.5
3	Technicians	11.3	13.4	13.8	12.5	19.3	20.9	20.5
4	Support personnel	37.7	44.5	46.1	41.8	64.2	69.8	68.5
5	Industry [2]	239.8	427.8	640.2	671.0	846.6	919.6	897.6
6	Scientists and engineers	95.9	171.1	256.1	268.4	348.4	372.3	363.4
7	Technicians	48.0	85.6	128.0	134.2	149.8	175.0	170.8
8	Support personnel	95.9	171.1	256.1	268.4	348.4	372.3	363.4
9	Universities and colleges [2]	33.2	50.8	69.3	93.8	99.9	123.3	123.2
10	Scientists and engineers [3]	21.5	32.8	44.6	60.8	64.5	80.0	79.9
11	Technicians	0.9	1.6	2.4	2.6	3.2	3.3	3.3
12	Support personnel	10.8	16.4	22.3	30.4	32.2	40.0	40.0
13	Other nonprofit institutions [2]	6.5	10.7	14.3	17.9	34.9	40.5	37.8
14	Scientists and engineers	3.6	5.9	7.9	9.9	19.4	22.5	21.0
15	Technicians	1.1	1.8	2.4	3.0	5.8	6.8	6.3
16	Support personnel	1.8	3.0	4.0	5.0	9.7	11.2	10.5
17	Total employment in R&D	366.2	591.7	829.8	878.8	1,129.1	1,243.9	1,216.1
18	Scientist and engineers	158.7	254.3	354.7	380.9	496.5	544.6	532.8
19	Technicians	61.3	102.4	146.6	152.3	178.1	206.0	200.9
20	Support personnel	146.2	235.0	328.5	345.6	454.5	493.3	482.4

[1] SOURCES AND METHODOLOGY

Line 1: Sum of lines 2, 3, and 4.

Line 2: 1950 and 1955—Derived as a residual, line 14 less lines 6 and 10. 1958, 1965, and 1970—National Science Foundation, NSF 72–300, "National Patterns of R&D Resources", 1953–72, p. 34. 1960—Hugh Folk, "The Shortage of Scientists and Engineers," Lexington, Mass., 1970, p. 69. 1971—Data provided by Morris Coburn, National Science Foundation.

Line 3: Relationship derived from 1962 data in National Science Foundation, NSF 64–28, "Scientific and Technical Manpower Resources," p. 65.

Line 4: It is assumed that for each scientists or engineer performing R&D there is one clerical or other type of support worker.

Line 5: Sum of lines 6, 7, and 8.

Line 6: 1950 and 1955—The number of scientists and engineers primarily employed in R&D was adjusted to a full-time equivalent basis using the relationship derived from 1954 data in National Science Foundation, NSF 68–30, "Employment of Scientists and Engineers in the United States, 1950–66," p. 22, and NSF 72–300, "National Patterns of R&D Resources," 1953–72, p. 34. 1958, 1960, 1965, 1970 and 1971—Same methodology as for line 2. 1971—Data provided by Morris Coburn, National Science Foundation.

Line 7: 1950, 1955, 1958, and 1960—Based on the relationship derived from 1962 from National Science Foundation, NSF 64–28, "Scientific and Technical Manpower Resources," p. 60. 1965—Based on the relationship derived for 1966 from labor, Bureau of Labor Statistics, bulletin 1609, "Scientific and Technical Personnel in Industry, 1961–66," p. 58.

Line 8: Same methodology as for line 4.
Line 9: Sum of lines 10, 11, and 12.
Line 10: 1950 and 1955—Same methodology as for line 6 for scientists and engineers (including graduate students) employed in R&D at universities and colleges. 1950, 1955, and 1960—Number of scientists and engineers employed at federally funded research and development centers (FFRDC's) computed using the average annual rate of growth for 1955 to 1958 derived from National Science Foundation data for 1950 and 1955 and the average annual rate of growth for 1959 to 1961 for 1960. The number of graduate students employed at FFRDC's in 1950 and 1955 is assumed to be the same as in 1954, and the number in 1960 is assumed to be the same as in 1961. 1958, 1965, 1970 and 1971—Same as methodology as for line 2. 1960—Same methodology as for line 2 for scientists and engineers (including graduate students) employed in R. & D. at universities and colleges. 1971—Data provided by Morris Coburn, National Science Foundation.
Line 11: The number of technicians employed in universities and colleges is assumed to be negligible because of the use of graduate students as technicians. The number of technicians employed in FFRDCs is based on the relationship noted in line 3.
Line 12: It is assumed that for every 2 scientists or engineers performing R&D there is one clerical or other type of support worker.
Line 13: Sum of lines 14, 15, and 16.
Line 14: 1950 and 1955—Computed using the average annual rate of growth for 1955 to 1958 derived from National Science Foundation data. 1958, 1965, 1970, and 1971—Same methodology as for line 2, 1960—Computed using the average annual rate of growth for 1959 to 1961 derived from National Science Foundation data. 1971—Data provided by Morris Coburn, National Science Foundation.
Line 15: Same methodology as for line 3.
Line 16: Same methodology as for line 12.
Line 17: Sum of lines 18, 19, and 20.
Line 18: 1950 and 1955—Same methodology as for line 6. 1958, 1965, 1970 and 1971—Same methodology as for line 2. 1960—Sum of lines 2, 6, 10, and 14.
Line 19: Sum of lines 3, 7, 11, and 15.
Line 20: Sum of lines 4, 8, 12, and 16.
[2] Including professional R&D personnel employed at federally funded research and development centers administered by organizations in the sector.
[3] Including graduate students. The full-time equivalent of graduate students employed in R&D at universities and colleges and at federally funded research and development centers was 7,500 in 1958, 13,400 in 1965, and 18,700 in 1970.

TABLE 14.—U.S.S.R.: ANNUAL GRADUATIONS IN ENGINEERING, BY FIELD [1]

Engineering field	1950		1960		1965		1970		1970 as a percent of 1950
	Thousand persons	Percent of total graduates	Thousand persons	Percent of total graduates	Thousand persons	Percent of total graduates	Thousand persons	Percent of total graduates	
Total graduations	37.0	100.0	120.0	100.0	170.0	100.0	257.0	100.0	694.6
Geology and survey of mineral resource deposits	1.7	4.6	3.9	3.2	3.2	1.9	5.1	2.0	300.0
Exploitation of mineral resource deposits	1.4	3.8	5.3	4.4	4.0	2.4	6.3	2.5	450.0
Power engineering	2.4	6.5	8.4	7.0	7.0	4.1	10.5	4.1	437.5
Metallurgy	1.4	3.8	3.9	3.2	4.8	2.8	6.5	2.5	464.3
Machine building and instrument making	9.1	24.6	30.6	25.5	46.0	27.1	69.0	26.8	758.2
Electrical engineering and electroinstrument making	1.4	3.8	8.1	6.7	24.6	14.5	40.5	15.8	2,892.9
Radio technology and communications	1.4	3.8	6.3	5.2	14.0	8.2	19.8	7.7	1,414.3
Chemical technology	2.6	7.0	5.7	4.7	10.1	5.9	16.1	6.3	619.2
Forestry engineering and technology of woods, cellulose, and paper	0.7	1.9	3.7	3.1	2.9	1.7	3.3	1.3	471.4
Technology of food products	2.3	6.2	3.5	2.9	4.8	2.8	7.9	3.1	343.5
Technology of consumer goods	1.2	3.2	3.1	2.6	3.2	1.9	5.4	2.1	450.0
Construction	4.9	13.2	17.7	14.7	21.3	12.5	30.3	11.8	618.4
Geodesy and cartography	0.3	0.8	0.6	0.5	0.9	0.5	1.0	0.4	333.3
Hydrology and meteorology	0.4	1.0	0.7	0.6	1.0	0.6	1.1	0.4	275.0
Transport (operations)	3.1	8.4	6.6	5.5	9.6	5.6	14.9	5.8	480.6
Agriculture	2.7	7.3	11.9	9.9	12.6	7.4	19.3	7.5	470.7

[1] Total graduations are from N. kh. 1970, p. 119. Other data are from N. kh. 1970, p. 646, and previous annual issues. Data for agriculture are derived as a residual. Because of rounding, components may not add to the totals shown.

TABLE 15.—UNITED STATES: DISTRIBUTION OF NATURAL SCIENTISTS, BY FIELD, AND NUMBER OF ENGINEERS [1]

	1950		1955		1958		1959		1960		1961		1962		1963	
	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent
Total natural scientists and engineers [2]	550.8	100.0	806.3	100.0	995.1	100.0	1,051.3	100.0	1,097.3	100.0	1,245.5	100.0	1,204.3	100.0	1,273.5	100.0
Natural scientists	146.3	26.6	208.5	25.9	268.9	27.0	287.5	27.3	300.5	27.4	316.0	25.4	334.8	27.8	355.1	27.9
Of which:																
Physicists and mathematicians	27.2	4.9	40.2	5.0	53.7	5.4	59.0	5.6	62.7	5.7	66.1	5.3	71.7	6.0	77.3	6.1
Chemists	51.2	9.3	72.8	9.0	89.3	9.0	94.3	9.0	98.4	9.0	101.6	8.2	105.6	8.8	108.7	8.5
Biological scientists	19.9	3.6	27.3	3.4	39.0	3.9	42.5	4.0	44.7	4.1	46.9	3.8	48.9	4.1	51.3	4.0
Geologists and geophysicists	11.2	2.0	15.3	1.9	18.4	1.8	19.1	1.8	18.5	1.7	18.7	1.5	19.2	1.6	20.4	1.6
Other physical scientists [3]	9.7	1.8	16.5	2.0	19.7	2.0	20.5	1.9	21.2	1.9	22.8	1.8	23.3	1.9	24.4	1.9
Agricultural scientists	17.2	3.1	22.6	2.8	27.7	2.8	29.9	2.8	30.9	2.8	32.8	2.6	35.8	3.0	39.0	3.1
Medical scientists	9.2	1.7	12.9	1.6	19.6	2.0	21.1	2.0	22.7	2.1	25.5	2.0	28.8	2.4	32.7	2.6
Engineers [4]	404.6	73.5	597.8	74.1	726.1	73.0	763.8	72.7	796.7	72.6	929.5	74.6	869.4	72.2	918.3	72.1

	1964		1965		1966		1968		1969		1970		1971	
	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent	Thousand persons	Percent
Total natural scientists and engineers [2]	1,320.1	100.0	1,361.3	100.0	1,412.8	100.0	1,543.2	100.0	1,577.3	100.0	1,710.0	100.0	1,750.0	100.0
Natural scientists	378.8	28.7	395.5	29.1	416.8	29.5	([5])	([5])	494.8	31.4	610.0	35.7	650.0	37.1
Of which:														
Physicists and mathematicians	83.5	6.3	87.9	6.5	92.8	6.6	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Chemists	113.5	8.6	116.0	8.5	119.3	8.4	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Biological scientists	54.3	4.1	55.6	4.1	56.8	4.0	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Geologists and geophysicists	21.5	1.6	23.6	1.7	24.4	1.7	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Other physical scientists [3]	25.5	1.9	26.2	1.9	28.3	2.0	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Agricultural scientists	42.1	3.2	44.7	3.3	47.6	3.4	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Medical scientists	37.2	2.8	40.9	3.0	46.2	3.3	([5])	([5])	([5])	([5])	([5])	([5])	([5])	([5])
Engineers [4]	941.3	71.3	965.8	70.9	996.0	70.5	([5])	([5])	1,082.5	68.6	1,100.0	64.3	1,100.0	62.9

[1] Sources: 1950–66—National Science Foundation, NSF 68-30, op. cit., p. 20, passim; 1968–71—estimated at the National Science Foundation.

[2] Because of rounding, components may not add to the totals shown.

[3] Including metallurgists and other specialties classified by the U.S.S.R. as engineering.

[4] Including all persons working in engineering positions, irrespective of degrees held.

[5] Not available.

Appendix B

Occupational Content of the "Scientific Workers" Category as Defined in the Soviet 1970 Census[1]

Directors and all faculty members of Institutions of Higher Education (VUZy), except teachers of physical culture
Directors of scientific-research establishments
Agroclimatologist-agronomist
Agroclimatologist, other
Agrometeorologist-agronomist
Agrometeorologist, other
Agronomist scientific worker
Agrochemist scientific worker
Academician (*Akademik*)
Academician—department secretary
Anthropologist-physician
Anthropologist, other
Archeographer scientific worker
Archeographer, other
Archeologist scientific worker
Archeologist, other
Archivist scientific worker
Architect scientific worker
Graduate student (*aspirant*)
Assistent[2] agronomist
Assistent architect
Assistent physician
Assistent of clinic
Assistent of laboratory science
Assistent artist
Assistent other than above, in scientific research establishments
Astronomer scientific worker
Aerologist engineer
Aerologist, other
Bacteriologist physician scientific worker
Bacteriologist scientific worker
Bacteriologist (in scientific research institutions).
Bibliographer scientific worker
Bioclimatologist scientific worker
Biologist-agronomist
Biologist-physician
Biologist-laboratory worker
Biologist scientific worker
Biologist, other
Biophysicist
Biochemist-physician
Biochemist laboratory worker
Biochemist scientific worker
Biochemist, other
Botanist laboratory worker
Botanist scientific worker
Botanist, other
Virologist-bacteriologist
Virologist-physician
Virologist, other
Vice President, Academy of Science
Orientalist
Physician scientific worker
Geneticist
Geobotanist
Geographer scientific worker
Geologist scientific worker
Geometrician
Geomorphologist
Geophysicist scientific worker
Geochemist scientific worker
Hydraulics scientific worker
Hydrobiologist
Hydrogeologist scientific worker
Hydrographer scientific worker
Hydrodyamics scientific worker
Hydrologist scientific worker
Hydroreclamation scientific worker
Hydrometeorologist
Hydromechanics scientific worker
Histologist
Active member of the Academy of Sciences
Doktor Nauk (persons with title Doctor of Science), except in VUZy
Candidates for the degree *Doktor Nauk*
Reclamation scientific worker
Metallurgist scientific worker
Meteorological engineer
Meteorological laboratory worker
Meteorologist scientific worker
Meteorologist, other
Mycologist scientific worker
Holders of title "Honored Scientist"
Zoogeographer
Zoologist labortory worker
Zoologist, other
Engineer scientific worker
Art critic
Researcher scientific worker
Researcher, other (at scientific research establishments)
Historian archivist
Art historian
Research historian
Literature historian
Historian scientific worker
Historian, other
Ichthyologist
Kandidat Nauk (persons with Candidate of Science degree), except at VUZy
Cinematographer
Climatologist
Consultant on scientific disciplines (except at VUZy)
Linguist
Literature specialist
Lithologist

[1] The categories listed in this Appendix are those given in *Sistematicheskiy slovar' zanyatiy*, Moscow, 1969, p. 59–62, and are given in the same order as they appeared in that publication.

[2] *Assistent* is a scholarly title analogous to the title "Assistant Professor" in the United States.

Appendix B—Continued

Magnetization engineer
Magnetization, other
Mathematician scientific worker
Paleontologist-geologist
Paleontologist, other
Pathophysiologist
Petrographer scientific worker
Microbacteriologist
Microbacteriologist physician (at scientific research institutes)
Microbacteriologist laboratory worker
Microbacteriologist (at scientific research institutes)
Mineralogist
Museum operator
Musicologist
Scientific worker laboratorian
Scientific worker, other
Scientific worker reviewer (academies, scientific research establishments)
Scientific worker-director
Scientific worker-associate
Oceanographer
Orientalist scientific worker
Ornithologist
Seismologist
Synoptical scientific worker
Sociologist
Theatrical specialist
Technologist scientific worker
Toxicologist scientific worker
Scientific secretary
Scientific curator of museum
Scientific expert
Physiologist physician
Pharmacologist, other
Physicist scientific worker
Physiologist physician
Plankton specialist
Soil scientist scientific worker
Professor—consultant
Professor (except at VUZy)
Chairman, Department of the Academy of Sciences
Chairman, of the Presidium of a branch of the Academy of Sciences
President of the Academy of Sciences
Psychologist
Psychophysiologist
Radiophysicist engineer
Radiophysicist, other
Roentgenologist scientific worker
Roentgeno-radiologist scientific worker
Director, agrobiological station (scientific)
Director, Academy (scientific research)
Director of independent archives (in republics, krays, oblasts, districts)
Director of archival preservation
Director of *aspirants* (except in VUZy)
Director of biological science stations
Director of botanical gardens
Director of bureaus of science
Director of computer centers (science)
Director of hydrometeorological station (except stations associated with transportation)
Physiologist laboratory worker
Physiologist scientific worker
Physiologist, all other
Philologist
Director of group, laboratory, or office (at scientific research and design establishments except those serving construction)
Director of National Forest
Director of zonal scientific research stations
Director of zoos
Director of scientific research institutes
Director of institutes for scientific information
Director of design institute (except those serving construction)
Director of the Cabinet (at scientific research institutes and design organizations except those serving construction)
Director of design bureau (except those serving construction)
Director of scientific research laboratory (at enterprises and establishments)
Director of problem laboratory
Directory of laboratory (at scientific research institutes and design bureaus except those serving construction)
Director of meteorological station
Director of scientific administration for the preservation of nature
Director scientific research Administration
Director of observatory
Director of experimental station (independent)
Director of experimental economic research administration
Director of a department (holding a scientific, technical, or production specialty) at scientific research or design establishments, except those serving construction and VUZy
Director of a department (without a specialty) at scientific research or design establishments, except those serving construction
Director of independent design bureau except those serving construction
Director of radiometer station
Director of radiometeorological station
Director of academic branch at scientific research institute
Director of branch institute at scientific research institute
Director of land slippage station
Philosopher
Phytopathologist scientific worker
Chemist biologist

Appendix B—Continued

Chemist scientific worker	Embryologist
Curator of funds scientific worker	Endocrinologist hubsandry specialist
Corresponding member of the Academy of Sciences	Power engineering scientific worker
Economic geographer	Entomologist scientific worker
Economist scientific worker	Ethnographer
Electrophysicist scientific worker	Linguist

Appendix C

Occupations and Duties Associated With Soviet R&D[1]

Occupational classification	*Duties*
Senior research worker:	
Doctor of Science	Independently formulates large basic and applied research ideas, goals, principles and methods of solution; directs branch development; actively guides the preparation of cadres; is involved in creative literature activities; leads scientific-technical participation in deciding most work goals in research and design; carries out especially complex calculations; consults with other institutions on scientific-technical questions.
Candidate of Science	Does the above but in a narrower scientific area; writes complex accounts and works on complex technical goals.
Junior scientific worker:	
Candidate of Science	Participates in carrying out basic and applied research or design work under the direction of a senior scientific worker or laboratory head; independently solves narrow (single) theoretical questions; works out the methods to be used in experiments; writes up sections of accounts and of technical documentations.
Engineer	Conducts research and design work under the direction of a junior scientific worker or senior engineer; independently carries out calculations of measuring methods; writes up sections of accounts and of technical documentations.
Head designer, chief specialist	Independently works on design goals or large sections, directs research, writes up the most complex sections of technical documentations; enters into agreement on scientific questions with other institutions; works out technical goals for subdivision.
Head engineer and engineer-designer—Category I	Independently or as the head of a group of workers engages in a narrow part of applied research or design in connection with a stated goal; designs and calculates more complicated elements of measuring methods; chooses scientific-technical solutions within the limits of stated goals; parcels out the work for the group; compiles accounts for the completion of work and for technical documentation.
Senior engineer and engineer-designer—Category II	Independently or as the head of a group of from three to six persons, conducts applied research or design within the limits of technical knowledge; writes sections of accounts; turns out simple technical documentation and presents it for the examination of head engineer or designers (category I); designs more complex documentation.

[1] Ye. I. Kissel', *Organizatsiya truda v issledovatel'skikh i proyektnykh uchrezhdeniyakh*, Moscow, 1969, p. 173–174.

APPENDIX C—Continued

Engineer and engineer-designer—Category III	Works out simple diagrams, designs, and processes under the direction of a more qualified specialist; carries out simple calculations for the majority of experiments, tests, and measures.
Senior technician	Under the direction of an engineer, executes simple diagrams and designs; regulates measuring and test equipment; participates in the preparation of prototypes; has excellent knowledge of measuring techniques and methods of measuring; registers the results of experiments.
Technician	Participates in the preparation of prototypes and testing and tuning simple equipment; has a knowledge of measuring devices, regulates their use, and registers the results of measures.
Laboratory assistant (without specialized education)	Helps more highly trained science workers, providing them with needed accessories (materials, components, technical documents, literature, measuring instruments, etc.); moves equipment and instruments, etc.

DEVELOPMENTS IN SOVIET EDUCATION

By DAVID W. CAREY

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TABLES

FIGURES

I. INTRODUCTION

Approaching the 1950's, the USSR faced a dilemma in fashioning its policies toward education. First, as in any rapidly developing country, an educated, skilled work force, able to manage a modern, in-

dustrial economy, was needed. Because the average educational attainment of the Soviet population was still quite low—and markedly lower than in the United States [1]—an expansion of the education system was clearly needed to provide young people with the specialized training necessary for easy assimilation into the labor force. Second, planners in the USSR could foresee a manpower shortage. The number of people in the able-bodied age group was expected to grow much more slowly in the 1960's than in the 1950's. At the same time, the impact of the expected decline in the rate of growth of the labor force was intensified by a diminishing growth of productivity—requiring larger increments of labor to maintain earlier rates of increase in output—and by the regime's declared policy of expanding the labor-intensive service sector.

Thus, Soviet leaders were torn between the need to expand school enrollments to raise the level of education of the work force and the need to restrict enrollments to push more workers into the labor force. This paper recounts the main trends in Soviet education in the 1960's, insofar as they bear on the training of men and women for participation in the labor force, and briefly describes the structure of Soviet education, the changes in education policy, and the trends in enrollment and graduations during this period. In the attempt to present a coherent description of trends in Soviet education, the paper touches lightly on some of the ground covered in earlier Joint Economic Committee papers. For a more complete analysis of the developments in the 1950's and mid-1960's, the articles by DeWitt, Rosen, and Goodman should be consulted.[2]

II. Background

The drive to eliminate illiteracy in the Soviet Union and to raise the educational level of the labor force began soon after the 1917 revolution. This drive was both politically and economically motivated. Politically, the regime was adamant in its desire to create the "new Soviet man," and to propogate the communist message, a literate audience was needed. Economically, the program to transform a backward, agrarian nation into a modern, industrialized economy demanded the conversion of a largely illiterate and unskilled population into a skilled and educated work force. It was necessary to increase the stock of high level manpower—primarily the scientists and engineers needed to develop or to adapt the technology vital for rapid economic growth—and to increase the knowledge and skills of other workers so that they could apply this technology.

Although the regime's revolutionary fervor perhaps has waned, dedication to education has not flagged. Leaders no longer declare that education should be a weapon to move society forward on the road to communism, as Lenin once did. More typically, leaders, like Premier

[1] In 1960, the median years of school completed by the population 16 years old and over—one measure of educational attainment—was 5.9 in the USSR and 10.9 in the United States. See US Bureau of the Census, *Estimates and Projections of Educational Attainment in the USSR: 1950–1985*, by Ann S. Goodman and Murray Feshbach, International Population Reports, Series P–91, No. 16, US Government Printing Office, Washington, D.C., 1967. p. 17.

[2] DeWitt, Nicholas, "High-Level Manpower in the USSR." U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, US Government Printing Office, Washington, D.C., 1966.

Goodman, Ann S., "Education," U.S. Congress, Joint Economic Committee, *Economic Performance and the Military Burden in the Soviet Union*, US Government Printing Office, Washington, D.C., 1970.

Rosen, Seymour M., "Changing Guideposts in Soviet Education," U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, US Government Printing Office, Washington, D.C., 1966.

Aleksey Kosygin, now say that "we must make an all-out effort to have our schools provide solid knowledge, instill the younger generation with a love for labor, a high sense of public responsibility . . ." [3] Party Chairman Leonid Brezhnev, recognizing the need for increasingly skilled workers, also has called for improvement in the quality of education to keep pace with developing technology. Public statements supporting education have been more than mere political rhetoric. Soviet leaders have consistently earmarked about 12% of annual state budget expenditures for education, as shown in the following tabulation.

Year	Total budget expenditures[1]	Budget expenditures for education[1]	Education's share of budget expenditures (percent)
	[Billion rubles]		
1940	17.4	2.2	12.6
1950	41.3	5.2	12.6
1960	73.1	8.0	10.9
1970	154.6	18.2	11.8
1971	164.2	19.3	11.8

[1] "Narodnoye khozyaysto" S.S.S.R., 1922—72, pp. 481, 484.

The results of this investment in education are impressive by any standards. The rate of literacy reported for the population 9 to 49 years of age increased from 44% in 1920 to 87.4% in 1939 and to 99.7% in 1970. Although the definition of literacy and the statistics cited for earlier years may be questionable, the dimensions of this accomplishment are not. Moreover, the number of people with at least eight years of formal education has increased markedly, and the number with a complete higher education has grown even faster:

	1939	1959	1972
Number of people per 1,000 people 10 years old and older, with:[1]			
Complete higher education	8	23	46
At least 8 years of formal education but less than a complete higher education	[2] 100	338	463

[1] "Narodnoye khozyaystvo," S.S.S.R., 1922–72, p. 37.
[2] At least 7 years of formal education in 1939.

The median level of education attained by persons 16 years old and older has been estimated at 5 years in 1950, 5.9 years in 1960, and 7.3 years in 1970. It will probably grow to 7.7 by 1975,[4] as the number of people completing a secondary education continues to grow due to the emphasis on universal ten-year education. The education system through which these large gains in educational attainment have been made presently encompasses about 80 million students in both part-time and full-time programs (see Table 1), roughly 60% more than the number enrolled in 1950.

[3] *Pravda Ukrainy*, 6 April 1966.
[4] U.S. Bureau of the Census, Goodman and Feshbach, *op. cit.*

TABLE 1.—U.S.S.R.: ENROLLMENT BY SCHOOL AND TYPE OF PROGRAM, 1970[1]

[Thousand students at the beginning of the school year]

Type of school	Total		Full-time		Part-time	
	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent
Higher education institutions	4,581	100	2,241	49	2,340	51
Specialized secondary schools	4,388	100	2,558	58	1,830	42
Vocational-technical schools[2]	2,380	100	2,156	91	224	9
General education schools	49,373	100	[3] 45,448	92	3,925	8
Worker schools[4]	18,822	100			18,822	100
Total	79,544	100	52,403	66	27,141	34

[1] "Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R.," pp. 24, 45, 121, 152, 155, 221.
[2] As of Jan. 1, 1971. At the beginning of the 1970 school year there were 2,411,000 students in all vocational-technical school programs.
[3] Of this total, 20,459,000 students are enrolled in primary schools, 19,863 in incomplete secondary schools, 4,764,000 in secondary schools, and 352,000 in programs of special education.
[4] Part-time or "alternating shift" programs to enable workers to complete a general education program without interrupting their employment.

The stock of highly qualified manpower has likewise increased spectacularly. The number of natural scientists employed in the USSR grew by 300% between 1950 and 1970, from 71 thousand to 284 thousand. During the same period the number of employed persons with degrees in engineering jumped by 520%, from 400 thousand in 1950 to almost 2½ million in 1970. In contrast, there were 610 thousand natural scientists in the US in 1970 and 1.1 million engineers. Comparisons must be used cautiously, however, because Soviet data substantially overstate the number of persons actually working as engineers.[5] Nevertheless, the Soviet educational system, by and large, has developed sufficiently to meet at least the minimum demands for trained professional and semiprofessional manpower, although not all shortages have been eliminated. The quality of these workers is more difficult to measure than their quantity. Most of them probably have been adequately prepared for the specialized positions that they hold, and those specifically trained for research and development have shown a considerable amount of creativity. In certain spheres of pure scientific research and in some areas of technology, Soviet scientists are the equal of any in the world.

III. The Structure and Administration of Soviet Education

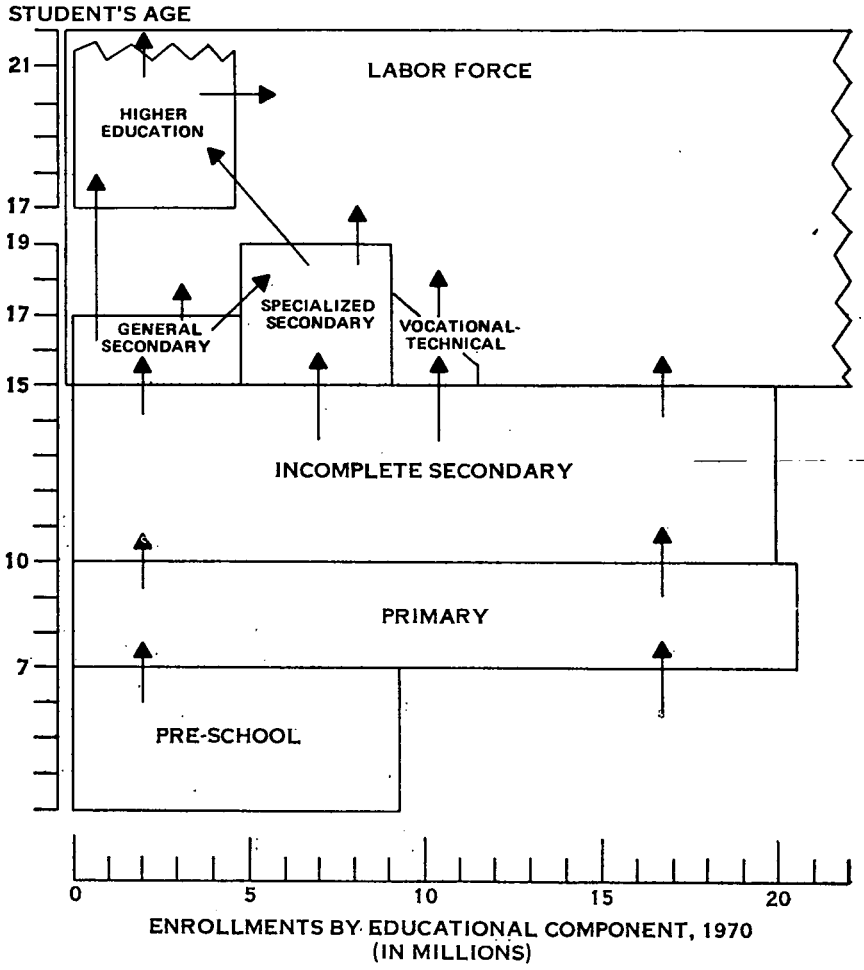
Structure

The Soviet Union has an extensive, integrated education system with a highly structured curriculum. (Figure 1). All Soviet children enter primary school (grades 1 to 3) at age seven and progress automatically into an incomplete secondary education program (grades 4 to 8). Universal compulsory education stops at the eighth grade, but Soviet policy has long sought to extend universal education beyond this level.

[5] For a discussion of the employment of scientists and engineers in general and employment in research and development in particular, see the paper by David W. Bronson, *Scientific and Engineering Manpower in the USSR and Employment in R&D*, in this compendium.

FIGURE 1.

The Structure of Soviet Education



In 1970, roughly three-fifths of the eight-year graduates continued their general education. Students who remain in school for an additional two years receive a complete general secondary education, roughly equivalent to a high school education in the US. Although students in the general secondary education curriculum are allowed to choose some electives, the choice is limited. The general secondary graduate, therefore, is usually not prepared to enter the Soviet labor force except as an unskilled worker. Upon completion of general secondary education, however, the student can apply to an institution of higher learning, or *VUZ*,[6] for full-time study leading to a professional degree. Admissions to full-time programs at *VUZy* are generally restricted to graduates of general secondary schools and held

[6] *Vysshiye uchebnyye zavedeniya* or higher education institution.

to about one-fifth of the number of high school graduates. Some of the students who are not admitted to *VUZy* enroll in a specialized secondary school (or *tekhnikum*) to learn a trade, but most enter the labor force where they may continue their education through evening or correspondence courses. Over one-half the students in higher education institutions are enrolled in part-time programs (see Table 1, above).

Students who do not finish the general high school curriculum may enroll in a vocational-technical school, enroll in a specialized secondary school, or enter the labor force. Vocational-technical schools offer a one to three year program of training in semi-skilled and skilled occupations such as agricultural machine operator, lathe operator, metal craftsman, bricklayer, electrician, and mechanic. In some vocational-technical schools, the student may receive a general secondary education in addition to occupational training. Although enrollment in these schools is presently small, they may eventually offer a viable alternative to the general secondary schools and help to reduce the disequilibrium between the number of general secondary school graduates and the number of students admitted to higher educational institutions.

Specialized secondary schools train skilled and semi-professional workers such as technicians, nurses, elementary school teachers, and various other specialists who, in general, function as assistants to the professional graduates of higher education institutions. In a specialized secondary school, the student may enroll in a program lasting up to four years, receiving the equivalent of a general secondary education as well as specialized technical training. Enrollment in these programs in 1970 reached almost 4.4 million, of which more than 40% were in part-time programs.

Higher education institutions provide the professional training in the Soviet Union, generally in courses of study lasting from 4 to 5 years. Students receive instruction in fields such as engineering and the physical sciences, agricultural sciences, law, economics and accounting, education, and medicine. Enrollments by specialty are determined according to the needs of the state, and training tends to be oriented to the engineering sciences rather than to the liberal arts.

After graduation from a *VUZ*, some students continue into graduate work. Following a one to three year term of study, students who successfully complete their comprehensive examinations and defend their dissertations receive a Candidate of Sciences degree, roughly equivalent to a Ph. D. in the US. Another graduate degree, the Doctor of Sciences, has no US counterpart and is reserved for established scholars who are deemed to have made outstanding contributions to their discipline.

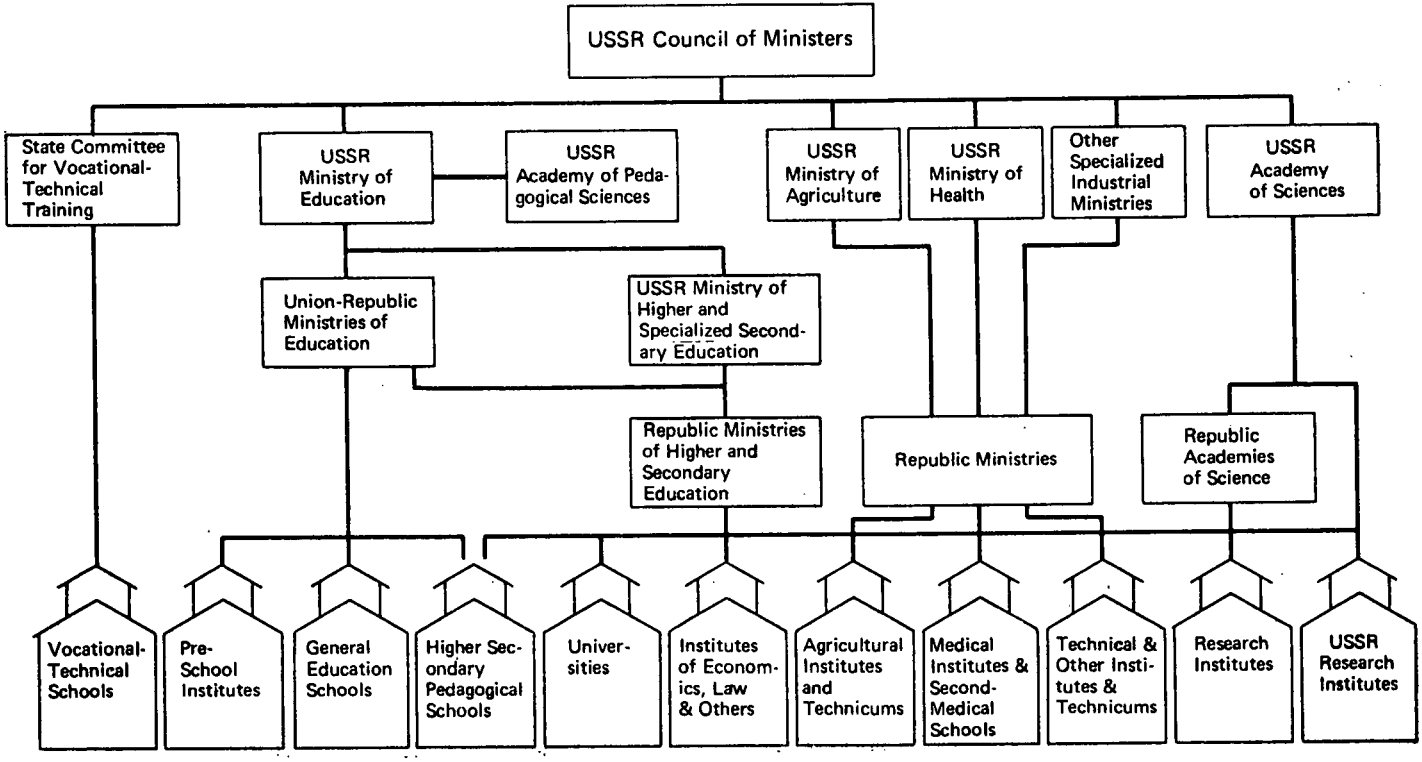
Administration

The administration of the Soviet Union's educational system is largely the responsibility of the USSR Ministry of Education which develops national education plans and controls the general education system through the work of the union-republic ministries of education (see Figure 2). The USSR Academy of Pedagogical Sciences forms the research arm of the Ministry of Education, and is mainly responsible for preparing educational reforms. The Ministry of Education

also supervises the USSR Ministry of Higher and Specialized Secondary Education, whose republic counterparts report both to the central organization and to the republic Ministries of Education. In addition, vocational-technical schools are controlled by the State Committee for Vocational-Technical Training, an agency of the USSR Council of Ministers.

FIGURE 2.

The Administration of Soviet Education

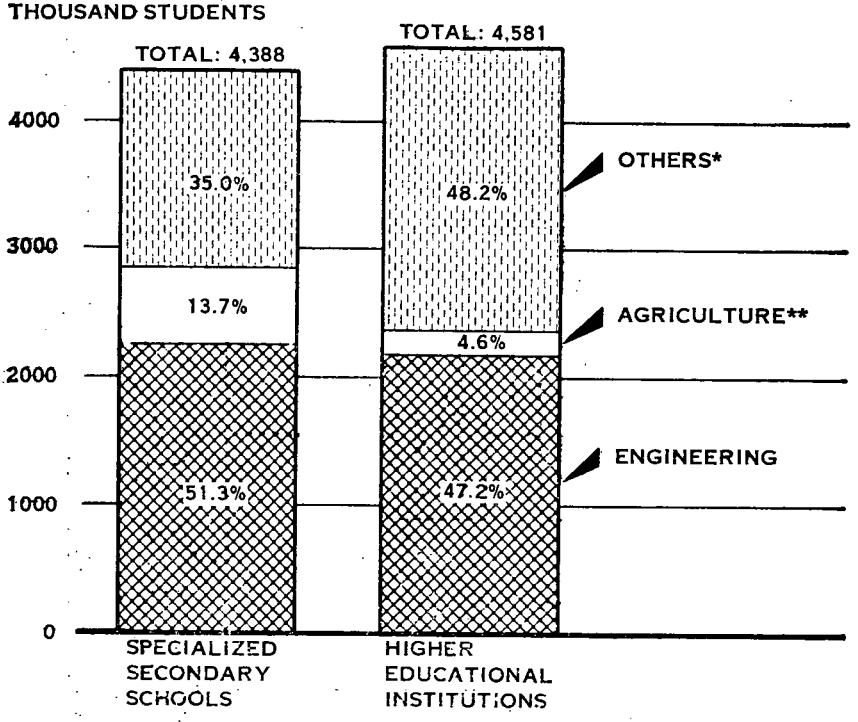


While the USSR Ministry of Higher and Specialized Secondary Education exercises policy control, direct administration of specialized secondary schools and of about one-half of the higher educational institutions is the responsibility of the government ministries in related fields. For example, industrial *tekhnikums* are controlled by industrial ministries, agricultural *tekhnikums* by the Ministry of Agriculture, and so forth. Programs of instruction offered by these institutions are tailored to the specific needs of the sponsoring ministries. The higher education institutions that are not controlled by these specialized ministries include universities and institutes of economics and law, among others, which are administered by the central and republic ministries responsible for higher education.

Partly because educational programs are intended to satisfy the requirements of individual ministries, training in most specialized secondary schools and higher education institutions tends to be narrowly specialized and to concentrate on technical subjects. In 1970, of the 4.4 million students in specialized secondary education programs and the 4.6 million students in higher education, about one-half were studying engineering specialities (see Figure 3).

FIGURE 3.

USSR: Enrollment by Specialty, 1970



*Includes specializations in economics, health and physical culture, education, and art for specialized secondary schools. In addition, enrollments in law, library science, and other non-engineering specialities are included for higher education.

**Includes engineering and non-engineering agricultural specialities in specialized secondary schools but only non-engineering agricultural specialities in higher education institutions.

IV. Developments in Soviet Education Since the Mid-1950's

Problems of the Mid-1950's

Soviet educational policies have changed with the needs of the economy and demographic trends. *A priori*, it would seem that the USSR's tightly controlled education system should be able to adjust easily to the economy's needs and could train students in the latest technology of their specialities. Yet the administration of Soviet education often has been so inflexible that imbalances—for example, between the number of high school graduates applying for college admission and the number admitted to college—have occurred, just as they have in non-centrally controlled societies.

Such an imbalance became evident to Soviet planners in the mid-1950's. While the number of young people reaching working age began to decline because of the low birthrates during World War II, the number of teenagers not in the labor force rose sharply after 1955. Obviously, youths were not being assimilated readily into the labor force. The problem was generated by an increase in the number of students completing a general high school program but not going on to higher education. These students were primarily trained only for continued schooling, rather than for a vocation, but higher education institutions were not expanded to accommodate them, as shown in the following tabulation:

	Full-time secondary education school graduates, June[1]	Full-time higher education 1st year students, September[2]	1st year full-time higher education students as a percent of full-time secondary education school graduates
	[Thousand Students]		
1950	228	228	100
1951	267	245	92
1952	325	249	77
1953	469	265	57
1954	864	276	32
1955	1,068	257	24
1956	1,242	231	19
1957	1,265	220	17
1958	1,292	216	17

[1] Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R., p. 102.
[2] Vyscheye obrazovaniye v S.S.S.R., p. 90.

A Soviet newspaper summed up the problem as follows:

> [The] number of students finishing secondary school considerably exceeds the number of students who can possibly be admitted to higher educational establishments. In coming years this gap will increase. Schools must prepare youths not only for entry to higher and secondary vocational education establishments but also for labor, for future practical work.[7]

This imbalance continued to grow, reaching a point where only one out of six high school graduates was admitted to college. Many youths not admitted to higher education institutions chose to remain unemployed—reapplying later for admission to higher education schools—rather than work as general laborers.

[7] *Komsomolskaya pravada*, 8 August 1954, p. 2.

The number of unemployed teenagers was aggravated by new legislation that priced young people out of the labor market. Many youths who wanted to work had difficulty finding jobs because (1) the employment of youths in overtime or night work was forbidden, (2) managers were required to pay 15, 16, and 17 year old workers for a full eight hours even though they worked less, and (3) workers enrolled in part-time education programs were entitled to generous amounts of additional paid leave to pursue their studies. Furthermore, competition for jobs increased following the partial demobilization of the armed forces in 1956–57 which swelled the ranks of civilian jobseekers.

Although the Soviet economy had an excess of labor in the late 1950's, Soviet planners could foresee that the number of people in the able-bodied age group would grow at significantly slower rates in the early 1960's. The slowdown would be the result of a decrease in the number of youths reaching working age, a general aging of the population, and a drop in the number of women in the prime childbearing ages.[8] At the same time, productivity growth was beginning to lag—requiring larger increments of labor to maintain earlier rates of increase in output—while an expanding and increasingly modern economy demanded a more highly skilled and better-educated labor force. The education reform of 1958, which was to provide a more vocationally oriented education for most students, was the official response to these pressures. In Khrushchev's words, education would be a combination of "learning and life."

The 1958 Education Reform

In a decree promulgated on 25 December 1958, the education system was to be changed to provide more occupational training relative to the existing academic curriculum. The new law declared that, "From the age of 15 or 16 all young people must undertake to perform socially useful labor consonant with their ability, and the entire subsequent education of young people must be linked with productive labor in the national economy."[9] The new law included the following provisions:

(*a*) Incomplete general secondary education—which was compulsory—was extended from seven to eight years.

(*b*) The three-year general secondary education school program was emended to include occupational training—requiring up to one-third of the regular secondary curriculum. People working full-time could obtain a general secondary education through a three-year course of study in evening or "alternating-shift" schools.[10]

(*c*) Vocational-technical schools were upgraded. They were to concentrate on students with an incomplete general secondary education, giving them a two to three year program of vocational training either in industrial enterprises or school shops.

[8] The number of people in the able-bodied ages—16 to 59 for men and 16 to 54 for women—grew at an average annual rate of 0.6% from 1958 to 1965, significantly lower than the average annual rate of 2.0% posted in the 1951 to 1957 period. The number of women in the prime child-bearing ages—18 to 34—declined from 34.137 million in 1959 to 29.104 million in 1965. The number of people of pension age—59 and over for men and 54 and over for women—grew at an average annual rate of 3.2% from 1950 to 1965, compared to the average annual rate of 3.6% recorded from 1951 to 1957.

[9] "On Strengthening Ties Between School and Life and on Further Developing the Public Education System in the USSR," *Pravda*, 25 December 1958, p. 1–2.

[10] Normally, people working full-time would work during the day and attend classes in the evening. For those working evening or swing shifts, classes are held during the day.

(*d*) Factory schools were reorganized into day or evening vocational schools with a one to three year program for urban youths and a one to two year program for rural youths.

(*e*) Specialized secondary institutions were charged with providing both part-time and full-time programs—lasting from two to four years—to both eight and eleven year school graduates.

(*f*) Of the students accepted at higher education institutions, up to 80% were required to have at least two years of work or military experience, and part-time programs in higher education were to be expanded.

Achievement of these goals hinged, to a large degree, on expansion of the part-time education system. From the regime's point of view, the benefits of part-time education were many. It was hoped that the program would be an incentive for youths denied admission to college—many of whom had not sought employment—to take jobs. In this way, part-time education would relieve some of the pressure on the over-taxed higher educational system. Moreover, the regime viewed the program as a relatively inexpensive way to bolster the level of skills in the labor force; the economy would have the benefit of the students' productive efforts as he received his education.

Problems With the Reform

The reform's basic provisions were to have been fully implemented by 1963, but several problems were encountered. Facilities necessary for occupational training—including textbooks and properly trained teachers—were in short supply. In addition, individual enterprises generally were not interested in training students; instead, students often were assigned menial chores during training sessions or merely were allowed to stand and watch the workers. Students, on the other hand, were required to take a full academic load in addition to their practical training sessions. As a result, studies often suffered, and many students switched to part-time programs where the quality of instruction was often inferior.

In the early 1960's, the weaknesses of the reform became evident. During 1961–65 the number of students in high school tripled, but articles in the press expressed renewed concern over unemployment among youths. Despite "anti-parasite" laws designed to prod youths who had left school into taking jobs, many young people remained out of the labor force, waiting to be admitted to college. Regulations governing the work of young people also hindered their employment, and vocational training still did not give young workers the skills for which factory managers were looking. Managers were unwilling to jeopardize the fulfillment of production plans by diverting skilled manpower and machines to the training of young workers, and the state had not provided the necessary incentives to induce them to do so. Moreover, the requirement that most students admitted to *VUZy* have two years of work experience led to a decline in the quality of higher education. After a hiatus of two or more years, many students found that they were ill-prepared to continue their studies.

In 1964, the official retreat from the 1958 reform began. The ten year program of complete general secondary education was reinstituted in the 1964–65 school year, and the amount of industrial training was reduced drastically. Training of secondary school students in fac-

tories was discontinued, and training in workshops attached to schools was cut back. At the same time, the regime modified the work requirement for entry into higher educational institutions, permitting a greater share of secondary school graduates to go directly into college. Finally, the growth of part-time education was curtailed. All these changes were directed at the alleged failures of the 1958 reform.

Post-1965 Policy Shifts

Although the 1958 reform was dismantled, the USSR's need for a more-skilled and better-educated labor force at all levels remained. It was officially noted that "the development of science and technology and the introduction of their achievements in production will require highly skilled workers capable of operating and servicing the new machinery." [11] But Soviet planners had learned that an across-the-board reorganization was not the way to bring the education system into tune with the economy's needs. Rather than inject polytechnical training into all kinds of schools, it now seemed more reasonable to expand schools specially designed to train technicians and skilled workers.

Vocational-technical schools were seen as one of the principal means to provide industrial training to students, and a program to expand and upgrade these schools began in the mid-1960's. However, the image of the vocational-technical school as a low-quality, quasi-reform school for difficult students and students who had not finished eight years of general education was a deterrent to expanded enrollments. Meanwhile, the vocational-technical graduate who wanted to continue his education, even if only to the high school level, had to attend night school, where the quality of eduaction was often worse. In 1966, a decree designed to upgrade vocational-technical education called for increased admissions of students who had already graduated from secondary schools but who wished to learn specific vocational skills.[12] To make the vocational-technical program even more attractive—and to aid in the drive for universal secondary education—a 1969 decree created a limited number of schools offering students with only eight years of education the opportunity to earn a high school diploma while receiving vocational training.[13] By 1971 there were 292,000 students in these programs, about 12% of the number in all vocational-technical schools, and plans for 1975 call for an enrollment of 400,000.

Other decrees and articles have called for the increased admission of women into the vocational-technical program, for upgrading rural schools, and for offering more agricultural specialties—a goal repeated in the Ninth Five Year Plan [14]—but have not produced much success. Indeed, a 1972 decree on vocational-technical education called for many of the same improvements discussed in 1965.[15] While the number of girls admitted to vocational-technical schools has grown faster than the number of boys admitted, presently only about one-quarter of total

[11] *Komsomolskaya pravda*, 24 September 1965, p. 2.
[12] "On Measures for Expanding the Instruction of and Employing in the National Economy Young People Who Will Graduate From General Education Schools in 1966," *Pravda*, 6 February 1966, p. 2.
For a summary of the major educational decrees since 1965 see the Appendix.
[13] "On Measures for Further Improving the Training of Skilled Workers in the Educational Institutions of the Vocational-Technical Education System," *Pravda*, 17 April 1969, p. 1.
[14] *Pravda*, 6 October 1970, p. 3.
[15] "On Further Improving the System of Vocational-Technical Education," *Pravda*, 29 June 1972, p. 1, 5.

yearly admissions are girls. Students from rural areas outnumber the students from the urban areas, but admissions from rural areas have grown at a slower rate than admissions from urban areas. Despite expanded vocational counseling in the general education schools, the persistence of problems in recruiting students is due in part to the poor image of vocational-technical schools and in part, oddly enough, to the drive for universal secondary education. General education schools and vocational-technical schools are often at loggerheads over the fate of the eight year graduate. Vocational counselors may push him toward the specialized school, while high school administrators often lead him toward the ninth grade in order to fulfill the plan and avoid any excess capacity caused by a leveling off in the number of students and increased enrollments in other types of secondary schools.[16]

General education schools have also received attention since 1965. First, a period of transition was needed to undo the 1958 reform. Texts and syllabuses were outmoded, and students were overloaded with work. A revision of the general education curriculum, which began in the mid-1960's, allowed general secondary school students a measure of specialization in their studies, partly through the selection of elective courses.[17] This change was intended to facilitate entry into the labor force for students not continuing their education, while those students who entered *VUZy* would have a better background for their studies. The introduction of these elective courses into the curriculum has proceeded so slowly, however, that the introduction of new study plans in all school courses is now a goal of the current Five Year Plan.[18] In 1970, a decree codified many of the changes made in the general education schools and renewed the pledge, voiced often in the past, to provide all young people with a complete ten-year education. In order to promote universal secondary education without increasing the pressure for admission to higher educational institutions, vocational counseling was supposed to become an integral part of the general education school. Specialized secondary schools also offered some new programs as an alternative to higher education.

While efforts at the secondary education level were aimed at providing a more specialized education, which would make graduates more employable, the opposite was true in higher education. Due to the narrow specialization in higher education, graduates developed a form of tunnel vision that made them less able to cope with problems caused by technological change. As a result, the Soviet press carried numerous articles calling for disciplines with a more liberal structure and the inclusion of some form of management training in most specialities.

Despite the rash of decrees,[19] changes in the education system have

[16] *Izvestiya*, 22 July 1970, p. 2. *Izvestiya*, 30 August 1972, p. 3.

[17] In addition to changes in the curriculum, the system of general secondary education—calling for four years of primary education, four years of incomplete secondary education, and two years of complete secondary education—was changed. Primary school would now only take three years, while incomplete secondary education would be expanded to five years.

[18] *Izvestiya*, 1 July 1969, p. 5. For a more detailed listing of the education goals in the Ninth Five-Year Plan see the Appendix.

[19] In addition to the two decrees on vocational-technical education and the decree on assimilating the 1966 graduates of general schools already cited, decrees were passed on improving the training of specialists in higher and specialized secondary schools (1966), on improving the general education school (1966), on improving the training of scientific cadres (1967), on the organization of preparatory departments at higher educational schools (1969), delineating the statutes regarding the general education school (1970), on completing the transition to universal secondary education (1972), and on further improving higher education (1972). These decrees are described in the Appendix.

been minor—partly because the regime recognizes the problems caused by the precipitous nature of the 1958 reform but also because many of the labor problems that led to the 1958 reform are no longer evident. In 1958, planners worried about labor surpluses and unemployed teenagers. The number of students graduated from full-time high school programs in 1970 still outnumbered those admitted to full-time education by four to one. Yet unemployment among teenagers is no longer a serious problem; the occasional pockets of worker shortages characteristic of the late 1950's and early 1960's have given way to a general, nationwide labor shortage. Skilled workers are needed, but, at the same time, workers need a higher level of general education to cope with technology's changing demands.

One problem that has persisted is the need to upgrade the quality of education. The emphasis has been on reducing the role of part-time education, especially in higher and specialized secondary education institutions. Because the 1958 reform effectively reduced the flow of students into full-time higher education programs, the share of students pursuing their education through evening or correspondence programs grew through 1965. Following the revision of the reform, the share of students studying full-time increased in both higher and specialized secondary schools. By 1975, 60% of the students in higher education and 64% of the students in specialized secondary schools are scheduled to be studying full-time (see Table 2).

Efforts to raise the quality of education in rural schools have not been as successful. Progress toward universal secondary education in rural areas has not kept pace with urban areas. Schools still are often too small and lack the necessary materials and qualified teachers for adequate education. Instructors in both elementary and secondary schools must often teach several grades simultaneously. The student dropout rate reportedly is high. A *de facto* admission of the low level of instruction in many secondary schools and especially of the inequality of rural education was made in 1968 when preparatory divisions of *VUZy* were created to prepare students, especially those from rural schools, for higher education entrance exams.[20]

[20] *Pravda*, 6 September 1969, p. 1.

TABLE 2.—U.S.S.R.: ENROLLMENT IN HIGHER AND SPECIALIZED SECONDARY EDUCATION INSTITUTIONS BY TYPE OF INSTRUCTION [1, 2]

[Thousand students]

	1950		1955		1960		1965		1970		1975 Plan	
	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent
Enrollment in higher education institutions	1,247.4	100.0	1,867.0	100.0	2,396.1	100.0	3,860.6	100.0	4,580.6	100.0	----------	100.0
Day	817.9	65.6	1,147.0	61.5	1,155.5	48.2	1,584.2	41.0	2,241.2	48.9	----------	60.0
Evening	27.2	2.2	80.9	4.3	245.4	10.3	569.0	14.8	657.3	14.4	----------	40.0
Correspondence	402.3	32.2	639.1	34.2	995.2	41.5	1,707.4	44.2	1,682.1	36.7	----------	
Enrollment in specialized secondary education institutions	1,297.6	100.0	1,960.4	100.0	2,059.5	100.0	3,659.3	100.0	4,388.0	100.0	----------	100.0
Day	1,064.5	82.0	1,469.8	75.0	1,090.8	53.0	1,835.3	50.2	2,558.4	58.3	----------	64.0
Evening	52.4	4.0	204.1	10.4	370.2	18.0	627.7	17.2	644.9	14.7	----------	36.0
Correspondence	180.7	13.9	286.5	14.6	598.5	29.1	1,196.3	32.7	1,184.7	27.0	----------	

[1] Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R., pp. 152, 155. Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaystva S.S.S.R. na 1971–1975 gody, p. 314.
[2] Columns may not add to totals shown due to rounding.

Trends in Individual Programs

Enrollment trends in all forms of education in the Soviet Union since 1955 reflect changing demographic factors and the regime's policy of extending the period of basic education. In 1971 the education system encompassed somewhat more than 80 million students in both part-time and full-time programs (see Table 3). More than 45 million of these students (almost 92 percent of the youths 7 to 16 years of age) were enrolled in full-time primary and general secondary education programs. The remaining students were enrolled in programs of part-time secondary education (4 million), specialized secondary education (4½ million), vocational training (2½ million), training for workers at their factories (19½ million), and higher education (4½ million). Due to a decline in the number of women in the prime childbearing ages during the early 1960's and a relatively low fertility rate, enrollments in general education schools have begun to taper off. However, enrollments in vocational-technical schools, factory training courses, specialized secondary schools, and higher education institutions increased both absolutely and as a share of total enrollments during the decade.

TABLE 3.—U.S.S.R.: ENROLLMENT IN EDUCATIONAL INSTITUTIONS[1]

(Thousand students at the beginning of the school year)

Type of school	1950	1955	1960	1965	1970	1971
General education schools of all types	34,752	30,070	39,187	48,255	49,373	49,229
Vocational-technical schools	882	1,356	1,141	1,701	2,411	2,425
Specialized secondary educational institutions	1,298	1,960	2,060	3,659	4,388	4,421
Higher education institutions	1,247	1,867	2,396	3,861	4,581	4,597
Training programs for new trades and raising qualifications in factory and other courses	10,591	9,673	10,909	14,381	18,822	19,547
Total enrollments	48,770	44,926	52,693	71,857	79,575	80,219

[1] Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R., p. 24. Narodnoye khozyaystvo S.S.S.R., 1922–1972, p. 425.

ELEMENTARY AND GENERAL SECONDARY EDUCATION

Unlike other educational levels, enrollments in full-time general education schools are governed almost exclusively by demographic factors. In the early 1950's, enrollments fell by some 15% (see Table 4) as the number of school age youths, especially in the eleven to fourteen age bracket, dropped. The USSR's post-war baby boom, however, caused full-time enrollments to jump by 3.4% annually from 1955 to 1960 and by 5.4% from 1960 to 1965. Since 1965, enrollments have virtually stagnated, growing at an average annual rate of only 0.7%. The decline in the number of women in the prime childbearing ages during the early 1960's has further caused an absolute drop in the number of youths seven to ten years old, and hence the number of students enrolled in classes one to four, since 1968. Although enrollment data given in the Ninth Five-Year Plan goals are inconsistent with other data, they indicate that enrollment in general education schools is planned to fall by slightly more than 1% annually during 1971–75.

Some of the most noteworthy fluctations in full-time enrollments have occurred in the complete general secondary program, classes

nine to ten.[21] From 1955 to 1958, the number of youths aged 15 to 16 fell nearly 50%, but enrollments in these classes dropped by only one-quarter because of a rise in the number of older students who resumed or began their education later. These students are reflected in the higher school participation rates, shown in Table 5, for classes 1 to 4 in 1950, classes 5 to 8 in 1955, and classes 9 to 10 in 1958. As the number of 15 to 16 year old youths rose after 1959, enrollments in grades 9 to 10 also climbed. Part-time enrollments in general education also rose during this period as the result of the 1958 reform. Because the full-time curriculum was lengthened by a year to accommodate the emphasis on occupational training, many students found that they could work full-time, attend school part-time, and still finish their general secondary education in three years. Since the end of the reform period, this has presumably become a less popular course of action, for the number of students in part-time programs has generally declined.

Although participation rates by age group are not a precise measure, mainly because of repeating students, they do indicate that universal eight year education has essentially been achieved. On the other hand, even though many students receive their secondary education in other types of schools—specialized secondary schools and to a lesser degree vocational-technical schools—little progress has been made in achieving universal ten year education since the mid-1960's.

VOCATIONAL-TECHNICAL EDUCATION

Although the practice of forcibly drafting youths into vocational schools was phased out in the early 1950's, vocational education remains an important means of training youths for semi-skilled jobs in industry and agriculture. Vocational schools originally trained youths who generally had less than seven years of formal education for work only in industry. In 1953, however, a program to train machine operators for agriculture was instituted, and in the following year schools were established to provide vocational training to youths who had received a high school education but still lacked a skill. The 1958 reform further altered the vocational education program by injecting some form of vocational training into the regular general education curriculum. Administration of the program was also reorganized in 1959. The Main Administration of the State Labor Reserve, formed in 1940 to centralize vocational education efforts, was replaced by the State Committee on Vocational-Technical Training, a committee of the USSR Council of Ministers.

In the early 1960's—while the 1958 reform was still in effect—enrollment in vocational-technical schools grew at an average annual rate of over 8%. During 1966–70 the regime's emphasis on the need for blue collar workers led to a yearly increase in the number of students attending vocational-technical schools of about 7%, twice the rate of growth posted by specialized secondary schools and by higher educational institutions. As a result, enrollment in vocational-technical schools as a share of total enrollment increased from 2.2% in 1960 to 2.4% in 1965 and 3.0% in 1971. Since 1965, vocational-technical schools have been expanded in two principal directions: enrollments of secondary school graduates who wished to learn specific vocational

[21] As a result of the 1958 reform, the complete general secondary program encompassed grades nine, ten, and eleven from the 1959–60 school year until the 1964–65 school year.

TABLE 4.—U.S.S.R.: ENROLLMENT IN GENERAL EDUCATION SCHOOLS[1]

[Thousand students at the beginning of the school year]

	1950	1955	1958	1960	1965	1966	1967	1968	1969	1970	1971
General education schools	34,752	30,070	31,483	36,187	48,255	48,170	48,902	49,195	49,426	49,373	49,229
Full-time general education schools	33,314	28,217	29,567	33,417	43,410	43,529	44,451	45,077	45,385	45,448	45,245
Classes 1 to 4	19,671	13,580	17,728	18,605	20,172	20,511	20,878	21,102	20,962	20,459	(2)
Classes 5 to 8	12,811	11,523	9,523	13,144	18,112	18,547	18,868	19,208	19,521	19,863	(2)
Classes 9 to 10 (11)	716	2,998	2,204	1,532	4,863	4,186	4,401	4,440	4,556	4,764	(2)
Special education classes[3]	116	116	112	136	263	285	304	327	346	362	(2)
Worker schools[4]	1,438	1,853	1,916	2,770	4,845	4,641	4,451	4,118	4,041	3,925	3,984

[1] "Narodnoye obrazovanive, nauka i kul'tura v S.S.S.R.," pp. 24, 78, 121. "Narodnoye khozyaystvo S.S.S.R., 1922–1972," p. 425.

[2] Not available.

[3] Special education classes for mentally and physically handicapped children.

[4] Part-time or "alternating shift" programs designed to enable workers to complete a general education program without interrupting their employment.

TABLE 5.—U.S.S.R.: PARTICIPATION IN GENERAL EDUCATION DAY SCHOOLS BY AGE GROUP

[In percent at the beginning of the school year]

	1950	1955	1958	1960	1965	1966	1967	1968	1969	1970	1971
Enrollment in:											
Full-time general education schools as a percent of youths age 7 to 16	88.8	88.0	91.1	86.7	94.8	92.9	93.0	92.7	92.2	91.5	91.6
Classes 1 to 4 as a percent of youths age 7 to 10	153.6	106.4	104.9	105.2	103.7	103.2	102.8	102.5	102.1	101.5	(2)
Classes 5 to 8 as a percent of youths age 11 to 14	70.9	109.2	88.0	90.7	101.1	101.2	100.9	99.5	99.3	99.6	(2)
Classes 9 to 10 as a percent of youths age 15 to 16	10.8	34.2	46.6	[1] 24.1	57.7	48.4	50.0	50.9	50.5	49.8	(2)

[1] Classes 9 to 11 as a percent of youths age 15 to 17.

[2] Not available.

skills have increased, and schools designed to provide eight year graduates with a high school diploma in addition to their vocational education have been created.

The number of students graduating from vocational-technical schools more than doubled during the 1960's, from 741 thousand in 1960 to 1,638 thousand in 1970. Most students are enrolled in full-time programs of instruction. Graduations from part-time programs rose markedly during the early 1960's under the 1958 reform but have failed to grow as a share of total graduations since.

According to the Ninth Five-Year Plan graduations will reach 1,982 thousand by 1975. The vast majority of the vocational-technical school graduates of the past thirty years have been trained for employment in industry and agriculture, as shown in the following tabulation: [22]

Number of graduates entering the economy, 1941–71

Sector of the economy:	*Millions*
Industry	9.9
Agriculture	6.6
Construction	3.9
Transportation and communications	1.9
Trade, municipal economy, and other areas	0.7
Total	23.0

The dominance of industry and agriculture is further shown in the data on yearly graduations in Table 6. Of the major branches of the economy, agriculture has trained by far the largest number of graduates since the late 1950's. These programs, however, as measured by the number of graduates, did not expand as rapidly as other programs during the 1960's. During the first half of the 1960's, graduations from vocational programs in industry grew at a pace second only to construction, and since 1965, industry has been the fastest growing sector.

Within industry, the machinery sector has always had the greatest number of vocational-technical trainees, but the most rapidly growing programs have been offered by the building materials industry. The number of graduations from the chemical and petrochemical industry increased rapidly during 1961–65 but slowed during the latter half of the decade. Conversely, graduations from programs in the oil extraction and refining industry and in electrical engineering increased more rapidly than graduations from other industrial programs in the late 1960's. Programs in sectors dealing with the consumer have also increased rapidly since 1960, especially training for light industry and the processed food industry. In addition, graduations from programs in housing and communal services reached almost 39,000 students by 1970.

[22] *Ekonomicheskaya gazeta*, No. 42, October 1972, p. 1.

TABLE 6.—U.S.S.R.: GRADUATION OF WORKERS FROM VOCATIONAL-TECHNICAL SCHOOLS BY BRANCHES OF THE ECONOMY AND OF INDUSTRY[1, 2]

[Thousands Persons]

	1950		1955		1960		1965		1970	
	Graduations	Percent	Graduations	Percent	Graduations	Percent	Graduations	Percent	Graduations	Percent
Total	493.4	100.0	650.5	100.0	741.1	100.0	1,100.4	100.0	1,638.2	100.0
Full-time programs	(3)	(3)	(3)	(3)	689.0	93.0	907.5	82.5	1,366.0	83.4
Industry	(3)	(3)	(3)	(3)	172.0	23.2	238.0	21.6	409.6	25.0
Electrical engineering	(3)	(3)	(3)	(3)	3.4	0.5	3.8	0.3	9.7	0.6
Oil extraction and oil refining industry	(3)	(3)	(3)	(3)	3.4	0.5	5.7	0.5	13.8	0.8
Coal industry	(3)	(3)	(3)	(3)	24.0	3.2	17.6	1.6	19.9	1.2
Ferrous and nonferrous metallurgy	(3)	(3)	(3)	(3)	11.5	1.6	13.8	1.3	24.0	1.5
Chemical and petrochemical industry	(3)	(3)	(3)	(3)	8.3	1.1	21.0	1.9	30.3	1.8
Mechanical engineering and metal working	(3)	(3)	(3)	(3)	82.3	11.1	108.9	9.9	186.8	11.4
Forestry, woodworking, and pulp and paper industry	(3)	(3)	(3)	(3)	11.2	1.5	13.7	1.2	19.9	1.2
Building materials industry	(3)	(3)	(3)	(3)	1.4	0.2	2.6	0.2	5.6	0.3
Light industry	(3)	(3)	(3)	(3)	14.7	2.0	30.8	2.8	62.6	3.8
Food industry	(3)	(3)	(3)	(3)	6.9	0.9	12.8	1.2	24.3	1.5
Printing industry	(3)	(3)	(3)	(3)	1.8	0.2	2.3	0.2	4.0	0.2
Other branches of industry	(3)	(3)	(3)	(3)	3.1	0.4	5.0	0.5	6.7	0.5
Agriculture	(3)	(3)	(3)	(3)	339.5	45.8	379.4	34.5	458.2	28.0
Transport and communications	(3)	(3)	(3)	(3)	40.2	5.4	48.1	4.4	73.6	4.5
Construction	(3)	(3)	(3)	(3)	119.0	16.1	200.9	18.3	289.7	17.7
Trade and public catering									26.6	1.6
Housing and communal services and everyday repairs and other services to the population									38.7	2.4
Other sectors	(3)	(3)	(3)	(3)	18.3	2.5	41.1	3.7	69.6	4.2
Part-time programs	(3)	(3)	(3)	(3)	52.1	7.0	192.9	17.5	272.2	16.6

[1] "Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R.," pp. 222, 230; "Trud v S.S.S.R.," p. 305.

[2] Columns may not add to totals shown due to rounding.

[3] Not available.

The profile of the student body in vocational-technical schools has changed somewhat in the direction charted by the decrees alluded to above, but youths from rural areas still outnumber those from urban areas and boys still outnumber girls (see Table 7). During the period when youths were drafted into vocational-technical schools the vast majority of students came from rural areas. A large number of the young people in rural areas failed to complete seven years of general education, and agriculture was generally considered a source of workers for the industrial labor force. As educational services in rural areas improved and as the supply of excess labor in agriculture declined, the share of students admitted from rural areas fell. Almost 60% of new admissions are still from rural areas, however, because vocational-technical schools still offer a more accessible means for rural youths to learn a skill than do higher or specialized secondary education schools. The number of girls admitted to vocational-technical schools has grown during the 1960's, but girls still comprise only one-quarter of the students admitted. Most girls, moreover, are enrolled in the relatively less skilled specialities while the highly skilled programs continue to be reserved for boys.

SPECIALIZED SECONDARY EDUCATION

Specialized secondary schools, which train technicians, are especially important for Soviet manpower planning. As the result of a spurt in enrollments of nearly 80% in the early 1960's, graduations from specialized secondary institutions grew at an average annual rate of about 13% in 1967–69, but the rate of increase has fallen off in the last three years:

	1956–60	1961–65	1966–70
Average number of students (in thousands):			
Enrollment	1,959.3	3,001.1	4,222.3
Graduations	515.3	514.4	889.3
Average annual rate of growth during the period (in percent):			
Enrollment	1.0	12.2	3.7
Graduations	4.5	5.1	10.7

The substantially smaller increase in enrollments in the last half of the 1960's—an addition of only 20% during 1966–70—portends a slower expansion in the number of graduates in the 1970's.

Meanwhile, efforts to fulfill the economy's changing needs have led to a shift in specialized secondary school enrollments by speciality or discipline (see Table 8). Between 1955 and 1960, engineering specialities—especially in the machinery sector—attracted a growing share of students. During the 1960's, enrollments in non-engineering specialities outpaced enrollments in engineering specialities, although during 1961–65, electrical engineering, chemical technology, and radio technology—the areas of study most needed by the USSR's space and defense programs—were among the fastest-growing specialities. Enrollments in these defense and space-related specialities declined in the late 1960's, however. Between 1965 and 1970, engineering specialities concerned with the exploration of mineral resources, the technology of food products, and construction, as well as the non-engineering disciplines of economics and health, made substantial gains, perhaps reflecting the increasing cost of supplying the country's basic raw materials and a greater emphasis on improving the lot of the consumer.

TABLE 7.—U.S.S.R.: PROFILE OF THE STUDENT BODY IN VOCATIONAL-TECHNICAL SCHOOLS [1]

[Thousand students]

	1950		1955		1960		1965		1970	
	Students	Percent	Students	Percent	Students	Percent	Students	Percent	Students	Percent
Total students admitted [2]	385	100.0	708	100.0	864	100.0	1,211	100.0	1,837	100.0
The number of students from:										
Urban areas	85	22.1	270	38.1	337	39.0	501	41.4	782	42.6
Rural areas	300	77.9	438	61.9	527	61.0	710	58.6	1,055	57.0
The number of:										
Boys	355	92.2	607	85.7	729	84.4	981	81.0	1,361	74.1
Girls	30	7.8	101	14.3	135	15.6	230	19.0	476	25.9
Total students graduated	493	100.0	650	100.0	741.1	100.0	1,100.4	100.0	1,638.2	100.0
From part-time programs					52.1	7.0	192.9	17.5	272.2	16.6

[1] Narodnoye obrazovaniye, nauka i kul'tura v. S.S.S.R., p. 222; Trud v S.S.S.R., p. 305.

[2] Estimate based on data in Trud v S.S.S.R., p. 307.

TABLE 8.—U.S.S.R.: ENROLLMENT IN SPECIALIZED SECONDARY SCHOOLS BY SPECIALITY[1,2]

[Thousand students at the beginning of the school year]

	1950		1955		1960		1965		1970	
	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent
Total enrollment	1,297.6	100.0	1,960.4	100.0	2,059.5	100.0	3,659.3	100.0	4,388.0	100.0
Engineering	522.1	40.2	979.6	50.0	1,120.4	54.4	1,942.1	53.1	2,250.8	51.3
Geology and survey of mineral resources	14.7	1.1	21.1	1.1	11.8	0.6	19.9	0.5	24.8	0.6
Exploration of mineral resources	43.3	3.3	60.7	3.1	42.6	2.1	42.7	1.2	68.2	1.6
Power engineering	48.1	3.7	84.1	4.3	98.4	4.8	180.4	4.9	218.5	5.0
Metallurgy	20.1	1.5	27.2	1.4	27.3	1.3	41.5	1.1	50.6	1.2
Machine building and instrument making	135.8	10.5	263.9	13.5	348.2	16.9	529.4	14.5	572.9	13.1
Electrical engineering and electrical instrument making	13.1	1.0	29.4	1.5	45.5	2.2	140.2	3.8	131.5	3.0
Radio technology and communication	25.6	2.0	66.3	3.4	71.1	3.5	140.0	3.8	138.7	3.2
Chemical technology	22.2	1.7	40.7	2.1	43.5	2.1	90.9	2.5	86.2	2.0
Forestry and technology of woods, cellulose, and paper	15.9	1.2	27.7	1.4	28.7	1.4	39.7	1.1	46.9	1.1
Technology of food products	22.8	1.8	36.3	1.9	66.6	3.2	118.9	3.2	150.7	3.4
Technology of consumer goods	24.6	1.9	48.8	2.5	59.7	2.9	102.0	2.8	109.9	2.5
Construction	79.6	6.1	181.1	9.2	152.0	7.4	247.7	6.8	362.7	8.3
Geodesy and cartography	4.1	0.3	8.7	0.4	6.4	0.3	7.3	0.2	9.0	0.2
Hydrology and meteorology	3.5	0.3	5.5	0.3	6.3	0.3	7.6	0.2	7.2	0.2
Transport	48.7	3.8	78.1	4.0	112.3	5.5	233.9	6.4	273.0	6.2
Agriculture (engineering and nonengineering)	150.0	11.6	298.1	15.2	292.4	14.2	497.6	13.6	601.1	13.7
Others	625.5	48.2	682.7	34.8	646.7	31.4	1,219.6	33.3	1,536.1	35.0
Economics	106.4	8.2	[3] 191.0	9.7	261.5	12.7	476.8	13.0	622.8	14.2
Health and physical culture	128.4	9.9	228.7	11.7	176.3	8.6	345.1	9.4	446.2	10.2
Education	345.3	26.6	234.0	11.9	154.3	7.5	299.0	8.2	340.1	7.8
Art	27.5	2.1	26.4	1.3	54.6	2.7	97.6	2.7	123.6	2.8
Other	17.9	1.4	2.6	0.1	----------	----------	1.1	(4)	3.4	(4)

[1] "Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R.," p. 156; "Narodnoye khozyaystvo S.S.S.R. v 1960 godu," p. 768.

[2] Columns may not add to total shown due to rounding.

[3] Including 500 students enrolled in law programs.

[4] Negligible.

Graduations and enrollments in higher education institutions during the 1960's have followed a pattern similar to that in specialized secondary schools. A rush of enrollments in higher education during 1961–65 resulted in a sharp rise in graduations in 1966–70, as shown in the tabulation below:

	1956–60	1961–65	1966–70
Average number of students (in thousands):			
Enrollment	2,188.4	3,262.7	4,406.8
Graduations	299.7	346.3	523.5
Average annual rate of growth during the period (in percent):			
Enrollment	5.1	10.0	3.5
Graduations	5.7	3.3	9.3

Enrollments during 1966–70 continued to grow but at a diminished rate.[23] Therefore, the economy has been receiving new university graduates at a slower pace in the last few years.

Again, the economy's changing needs are reflected in shifts in university enrollments by specialities, as shown in Table 9. From 1960 to 1965, enrollments in engineering programs offered by higher education institutions outpaced total enrollments. Within engineering, specialities in electrical engineering, radio technology and communications, and chemical technology had the fastest rates of growth. Enrollments in power engineering, hydrology and meteorology, geodesy and cartography, and the exploration of mineral resource deposits recorded the lowest rates of increase. As with technicians, the emphasis was on training professionals in the newest technology.

From 1965 to 1970, the share of enrollments accounted for by engineering specialities in general, and electrical engineering, radio technology and communication, and chemical technology in particular, decreased slightly. Enrollments in specialities related to the technology of consumer goods production, forestry engineering, and construction posted moderate increases, but on an absolute scale, their share of enrollments remained small. The growth in enrollments in the engineering specialities was outstripped by the increase in enrollments in non-engineering disciplines. Of these specialties, economics, public health, and law grew at the fastest rates, accounting for 21% of total university enrollments in 1970.

Given the degree of control exercised by the state over enrollments in both specialized secondary schools and universities, the changes in enrollments by speciality seem to be the result of a shift in educational policy. The all-out emphasis on the glamour fields of new technology has been curbed. As part of the search for efficiency, more attention is being given to long neglected consumer sectors, to more traditional areas of industry and construction, and to professional training geared to planning—notably economics. The shift in emphasis may have gone too far, however. According to the Ninth Five-Year Plan directives, ". . . the national economy's need for young specialists is being met unevenly. There is still some shortage of engineers specializing in power engineering and construction, certain specializa-

[23] In 1970, there were about 4¼ million students enrolled in higher education institutions in the USSR compared with about 6 million students in colleges in the United States.

TABLE 9.—U.S.S.R.: ENROLLMENT IN HIGHER EDUCATIONAL INSTITUTIONS BY SPECIALTY [1, 2]

[Thousand students at the beginning of the school year]

	1950		1955		1960		1965		1970	
	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent
Total enrollment	1,247.4	100.0	1,867.0	100.0	2,396.1	100.0	3,860.6	100.0	4,580.6	100.0
Engineering	346.4	27.8	701.0	37.5	1,081.1	45.1	1,866.1	48.3	2,161.2	47.2
Geology and survey of mineral resource deposits	16.2	1.3	32.3	1.7	21.3	0.9	31.1	0.8	39.3	0.9
Exploration of mineral resource deposits	20.9	1.7	36.5	2.0	30.2	1.3	39.5	1.0	57.0	1.2
Power engineering	23.8	1.9	52.5	2.8	74.7	3.1	85.9	2.2	100.8	2.2
Metallurgy	14.7	1.2	24.7	1.3	31.5	1.3	46.7	1.2	55.5	1.2
Machine building and instrument making	86.3	6.9	172.5	9.2	302.8	12.6	501.5	13.0	557.9	12.2
Electrical engineering and electrical instrument making	14.2	1.1	36.2	1.9	91.5	3.8	281.0	7.3	309.4	6.8
Radio technology and communication	15.6	1.3	39.8	2.1	78.3	3.3	150.9	3.9	154.1	3.4
Chemical technology	23.9	1.9	37.6	2.0	56.3	2.3	107.0	2.8	120.2	2.5
Forestry and technology of woods, cellulose, and paper	8.7	0.7	20.5	1.1	22.9	1.0	30.4	0.8	31.0	0.7
Technology of food products	10.0	0.8	18.2	1.0	31.3	1.3	57.0	1.5	72.2	1.6
Technology of consumer goods	9.5	0.8	20.1	1.1	28.8	1.2	39.4	1.0	54.2	1.2
Construction	37.1	3.0	93.2	5.0	146.7	6.1	232.8	6.0	297.3	6.5
Geodesy and cartography	2.8	0.2	3.5	0.2	5.9	0.2	7.7	0.2	8.7	0.2
Hydrology and meteorology	2.8	0.2	4.1	0.2	5.2	0.2	6.6	0.2	8.4	0.2
Transport	23.7	1.9	36.6	2.0	65.6	2.7	112.6	2.9	133.1	2.9
Agriculture	36.2	2.9	72.6	3.9	88.1	3.7	136.0	3.5	162.1	3.5
Others	901.0	72.2	1,166.0	62.5	1,315.0	54.9	1,994.5	51.7	2,419.4	52.8
Agriculture and forestry	71.5	5.7	119.2	6.4	148.2	6.2	196.5	5.1	209.8	4.6
Economics	72.6	5.8	131.5	7.0	217.7	9.1	386.2	10.0	538.6	11.8
Law	45.4	3.6	38.8	2.1	40.3	1.7	60.0	1.6	77.0	1.7
Public health and physical culture	113.3	9.1	159.7	8.6	189.2	7.9	242.5	6.3	329.8	7.2
University specialities	87.5	7.0	126.7	6.8	186.9	7.8	279.4	7.2	344.5	7.5
Pedagogy and library science	496.3	39.8	576.3	30.9	512.8	21.4	797.1	20.6	880.6	19.2
Others	14.4	1.2	13.9	0.7	19.9	0.8	32.8	0.8	39.1	0.9

[1] "Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R.," pp. 153–154; "Vyschee obrazovaniye v S.S.S.R.," pp. 82–83.

[2] Columns may not add to totals shown due to rounding.

tions having to do with machine building, radio engineering and communications, and calculator and computer engineering." [24] In trying to align higher education with the economy's needs perfectly, however, Soviet planners may expect too much. No modern society has been able to achieve such a degree of harmony.

GRADUATE STUDY

The number of graduate students increased by more than 1½ times during the 1960's, with most of this growth occurring during the first half of the decade (see Table 10). As in specialized secondary schools and higher educational institutions, shifts in the enrollment of graduate students by branch of science reflect the economy's changing priorities. In the early 1960's, the physical sciences and engineering were among the fastest growing branches of science, but since 1965, they have been outpaced by economics, pedagogy, and other social sciences. Nevertheless, engineering remains by far the largest single branch of graduate study, accounting for about 40% of all graduate students.

[24] *Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaystva S.S.S.R. na 1971–1975 gody*, p. 312.

TABLE 10.—U.S.S.R.: ENROLLMENT OF GRADUATE STUDENTS BY BRANCH OF SCIENCE [1, 2]

[At the end of the year]

	1950		1955		1960		1965		1970	
	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent	Enrollment	Percent
Total	21,905	100.0	29,362	100.0	36,754	100.0	90,294	100.0	99,427	100.0
Physics-mathematics	972	4.4	2,855	9.7	3,435	9.3	10,066	11.1	11,729	11.8
Chemistry	1,319	6.0	1,318	4.5	2,402	6.5	5,372	5.9	5,313	5.3
Biology	1,247	5.7	1,426	4.9	1,877	5.1	6,029	6.7	5,457	5.5
Geology-mineralogy	503	2.3	1,260	4.3	1,313	3.6	2,691	3.0	2,551	2.6
Engineering	5,809	26.5	9,358	31.9	13,936	37.9	35,733	39.6	39,979	40.2
Agriculture	1,774	8.1	2,564	8.7	2,484	6.8	6,391	7.1	5,634	5.7
Veterinary	391	1.8			393	1.1	932	1.0	678	0.7
History	1,591	7.3	2,064	7.0	1,206	3.3	2,447	2.7	2,945	3.0
Philosophy	1,016	4.6			520	1.4	1,629	1.8	2,344	2.4
Economics	1,366	6.2	1,810	6.2	2,776	7.6	7,010	7.8	9,964	10.0
Philology	1,980	9.0	2,164	7.4	1,471	4.0	2,309	2.6	2,597	2.6
Geography	328	1.5	359	1.2	402	1.1	781	0.9	814	0.8
Law	748	3.4	367	1.2	402	1.1	706	0.8	900	0.9
Pedagogy	862	3.9	1,037	3.5	956	2.6	1,480	1.6	2,097	2.1
Medicine	1,319	6.0	2,164	7.4	2,558	7.0	5,255	5.8	4,842	4.9
Pharmacy	67	0.3			27	0.1	124	0.1	160	0.2
Art	459	2.1	430	1.5	448	1.2	850	0.9	578	0.6
Architecture	154	0.7	186	0.6	148	0.4	489	0.5	497	0.5
Psychology									316	0.3
Other									[3] 32	(4)

[1] Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R., p. 275; Kul'turnoye stroitel'stvo S.S.S.R., p. 257.

[2] Columns may not add to totals shown due to rounding.

[3] Residual.

[4] Negligible.

In contrast to the situation in specialized secondary schools and undergraduate programs, however, the share of students involved in full-time graduate studies has fallen, from about 62% of enrollments in 1960 to about 54% in 1971 (see Table 11). In recent years this reflects in part a slight increase in the number of students who pursue their graduate studies in scientific organizations, where part-time programs are more popular, instead of through higher education institutions. In 1971, 42,311 students were enrolled in scientific organizations, and 24,469 of these students—or 58%—were in part-time programs. Higher education institutions accounted for 56,997 students, with only 37% in part-time programs.

TABLE 11.—U.S.S.R.: ENROLLMENT AND GRADUATION OF GRADUATE STUDENTS BY TYPE OF INSTRUCTION [1]

	1950		1955		1960		1965		1970		1971	
	Students	Percent	Students	Percent	Students	Percent	Students	Percent	Students	Percent	Students	Percent
Enrollment: [2]	21,905	100.0	29,362	100.0	36,754	100.0	90,294	100.0	99,427	100.0	99,338	100.0
Full-time	18,143	82.8	21,357	72.7	22,978	62.5	51,109	56.6	55,024	55.3	53,839	54.2
Part-time	3,762	17.2	8,005	27.3	13,776	37.5	39,185	43.4	44,403	44.7	45,469	45.8
Graduations:	4,093	100.0	7,607	100.0	5,517	100.0	19,240	100.0	25,870	100.0	26,488	100.0
Full-time	3,649	89.2	6,536	85.9	4,125	74.8	13,465	70.0	16,462	63.6	17,006	64.2
Part-time	444	10.8	1,071	14.1	1,392	25.2	5,775	30.0	9,408	36.4	9,482	35.8

[1] Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R., pp. 272, 279; Narodnoye khozyaystvo S.S.S.R. v 1960 godu, p. 788.
[2] At the end of the year.

V. Outlook for Education's Contribution to Economic Growth

Since 1965, although the Soviet education system has not been radically changed or reorganized, some shifts of emphasis have occurred. Many of the changes in Soviet education have been aimed at improving the skills and raising the general education level of workers. The further development of vocational-technical schools is being stressed, and a number of these schools now offer students a high school diploma in addition to vocational training. Meanwhile, the drive for universal ten year education continues, and efforts to upgrade the quality of education at all levels have led to a decline in the importance of part-time education programs. Adjustments have also been made in higher education. Attention has been called to the need to overcome the effects of narrow specialization, and enrollments in specialities dealing with the consumer, the more traditional areas of industry and construction, and planning have increased.

Economic growth is affected by the educational system, which determines both the type of work an individual can do and also his efficiency in doing it. Edward Denison has estimated that between 1950 and 1962 the increase in the educational attainment of the labor force contributed about 15% of the economic growth of the United States and approximately 5% of the growth of nine countries in northwestern Europe.[25] Likewise, industrialization in the USSR has been made possible in part by an education system that has both raised the minimum level of education and developed a stock of highly qualified specialists.

[25] Denison, Edward F., *Why Growth Rates Differ: Postwar Experience in Nine Western Countries*, The Brookings Institute, Washington, D.C., 1967, pp. 299–317.

Although the exact contribution of the Soviet education system to the USSR's economic growth cannot be measured, a slowdown in the rate of growth of educational attainment and a need to alter the content of specialist training may mean that education will play a lesser role in determining the future rate of Soviet economic progress.

Early efforts aimed at erasing illiteracy in the Soviet Union have been successful, as the USSR now claims that 99.7% of the population is literate compared with only 44% in 1920. Gains have also been made in raising the minimum level of compulsory education. Universal eight year education has been achieved and progress is being made on providing universal ten year education for all youths. Despite these efforts, however, the labor force is not as highly trained as the recent accomplishments in education imply. This is in part a heritage of the past, for there are still many workers in the older age groups who grew up in peasant households with little formal training. Presently about one-third of the Soviet labor force has less than 8 years of education and not even one of every ten workers has finished college:

	1959			1970		
	Total	Urban	Rural	Total	Urban	Rural
Number of workers per 1,000 workers with:[1]						
Higher education	33	59	11	65	90	25
Incomplete higher education	9	12	7	13	16	7
Specialized secondary education	67	96	41	105	131	63
General secondary education	64	94	36	159	192	106
Incomplete secondary education	260	303	221	311	319	298
Primary education	331	307	352	248	192	338
Less than primary education	236	129	332	99	60	163

[1] Itogi vsesoyuznoye perepisi naseleniya 1970 goda, III tom, uroven' obrazovaniya naseleniya S.S.S.R., p. 408.

Although the present situation is a significant improvement over the condition in 1959, it is not remarkable. A distinct separation between the education levels attained by urban and rural workers still exists. Also, the limited data showing educational attainment in various industrialized countries suggest that the schooling of the Soviet labor force in 1972 was far less than that of the U.S. labor force in 1972 or the British labor force as long ago as 1951. The educational attainment of the Soviet labor force has surpassed that of Italy's but is still roughly at the level achieved in France in 1954. The current emphasis

	Percentage distribution of the labor force				
Years of education	U.S.S.R.[1] 1972	USA[2] 1972	France[3] 1954	United Kingdom[3] 1951	Italy[3] 1961
Less than 8	46	11	43	5	82
8 to 12	[4] 47	67	48	91	12
More than 12	[5] 7	22	9	4	6
Total	100	100	100	100	100

[1] Level of education obtained by persons 16 years old and over from U.S. Bureau of the Census, Goodman and Feshback, op. cit., p. 16–17.
[2] Level of education obtained by persons 14 years old and over from U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 243, "Educational Attainment: March 1972."
[3] Denison, Edward F., op. cit., p. 80.
[4] Share of persons 16 years old and over with an incomplete secondary, general secondary, and specialized secondary education.
[5] Share of persons 16 years old and over with an incomplete higher and higher education.

on universal secondary education will undoubtedly continue to raise the basic educational level of youths entering the labor force, while the emphasis on vocational-technical training will help to raise the level of skills among blue-collar workers. According to estimates and projections made by the US Bureau of the Census, however, the median years of school attained by the adult population in the Soviet Union is increasing at a decreasing rate. Between 1965 and 1970 the median years of school attained rose by about 11%, from 6.6 years to 7.3 years. Between 1970 and 1975, however, the median years of school is projected to grow by roughly 5%, to 7.7 years.[26]

The stock of high quality manpower [27] can also be expected to grow at a much slower rate during the next few years than it has since the mid-1960's. The number of new technicians and specialists from specialized secondary schools and higher education institutions, as well as the number of graduate students, grew rapidly during the 1960's, due to an earlier spurt in enrollments (see Figures 4A, 4B, and 4C). However, enrollments have tapered off since about 1967, implying a slower rate of growth of professional and technical manpower in the future. This slowdown is confirmed by the goals of the Ninth Five-Year Plan. The graduation of specialists with higher and specialized secondary educations during 1971–75 is to increase by only one-quarter over the preceding five-year period, while the number graduated during 1966–70 represented a 65% boost over the 1961–65 period.

[26] U.S. Bureau of the Census, Goodman and Feshback, *op. cit.*

[27] As used in this paper, high quality manpower includes technicans trained in specialized secondary schools and specialists trained in higher education institutions as well as in graduate schools.

FIGURE 4A.

USSR: Enrollment and Graduations in Specialized Secondary Schools

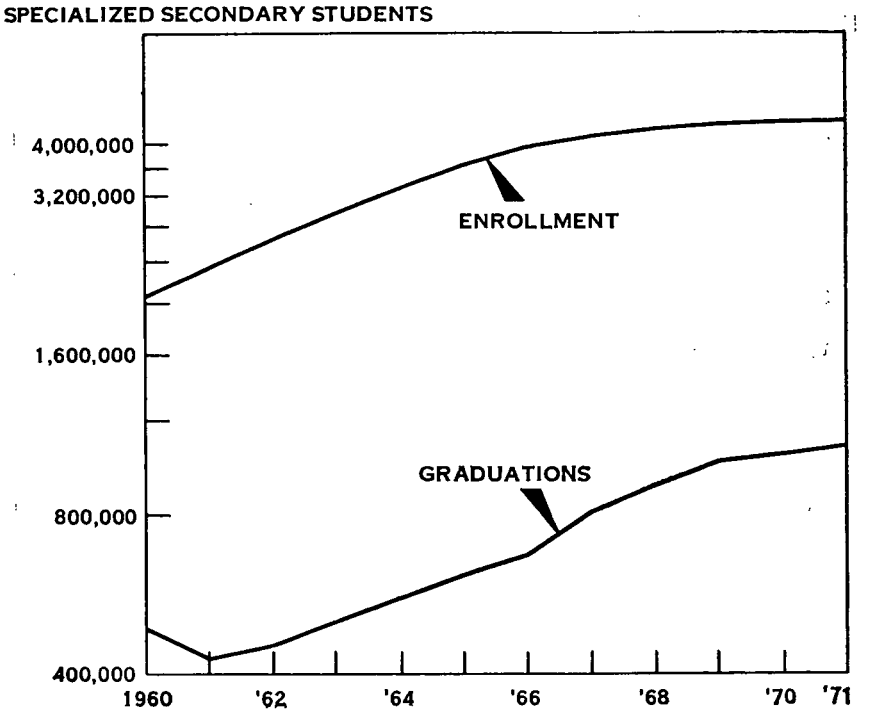


FIGURE 4B.

USSR: Enrollment and Graduations in Higher Education

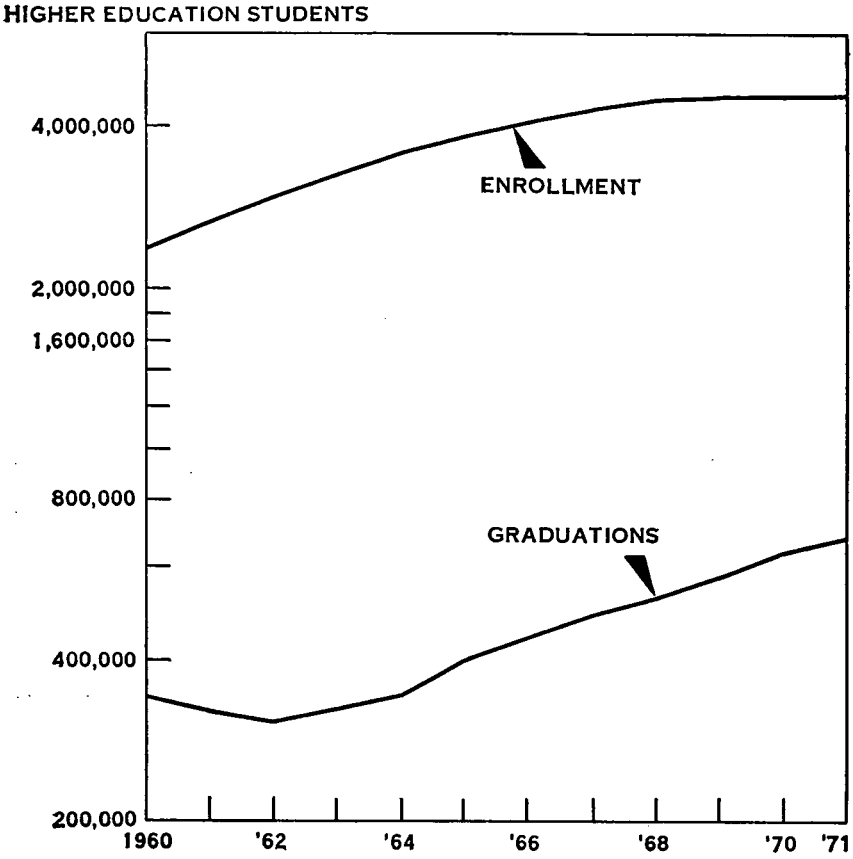
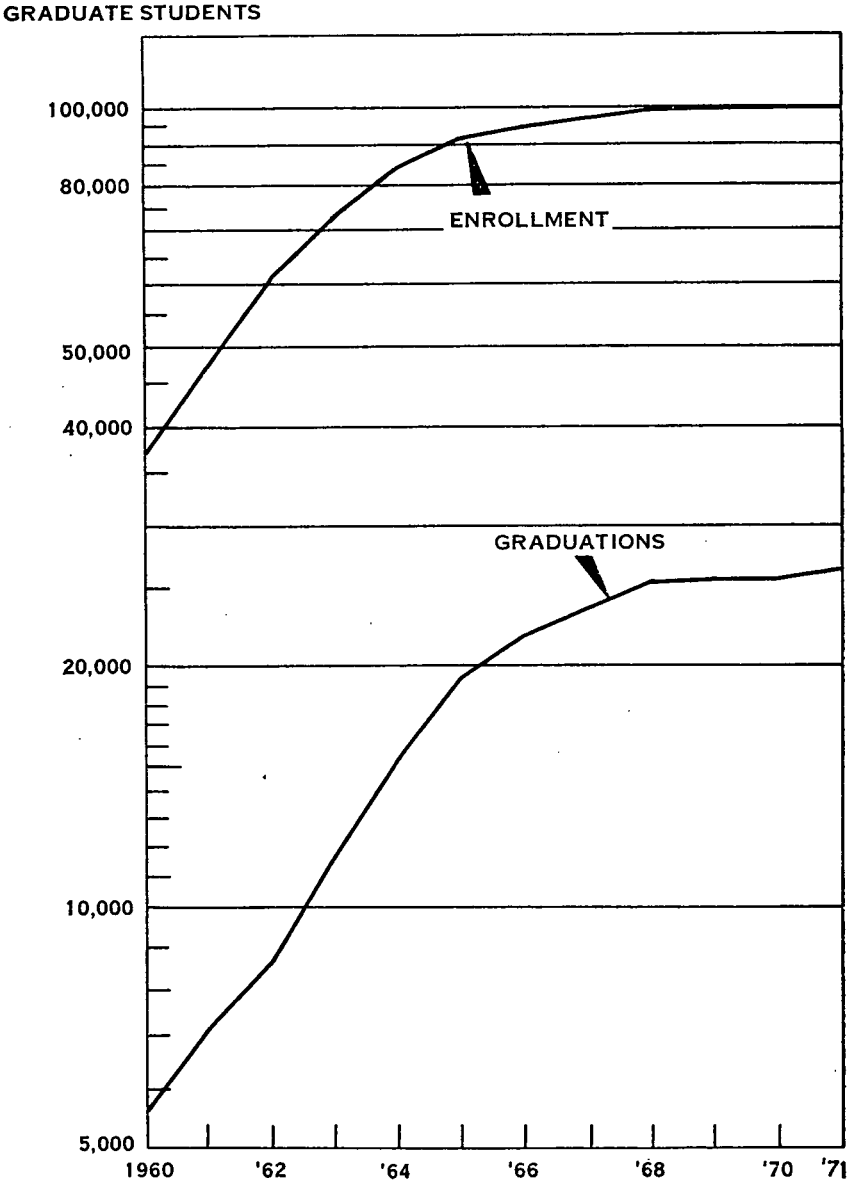


FIGURE 4C.

USSR: Enrollment and Graduations in Graduate Education



A slower growth in numbers might be offset if the productivity of these specialists could be improved more rapidly. Currently their productivity is admittedly low—mainly because of factors not controlled by the education system, such as a lack of technical equipment and the nature of organization and management in the Soviet economy. But the training that specialists receive also affects their productivity. Because this training is too narrowly specialized, engineers and other specialists are often ill-equipped to deal with the problems of a modern technology which require an across-the-board, multi-discipline approach. In addition, this high degree of specialization restricts the worker's mobility within the economy, for he often lacks the background necessary to adapt his skills to different situations or is placed in a position for which he has not been adequately trained.

Another factor that depresses the productivity of high quality manpower is the underemployment of specialists, as a result of a lack of technicians. The mix of specialists and technicians is unsatisfactory even by the USSR's self-imposed standards. A 1963 decree called for three to four technicians with a specialized secondary education for every specialist with a higher education in industry, construction, transport, and agriculture.[28] Although graduations from specialized secondary schools since 1960 have grown at a faster rate than graduations from higher educational institutions, it seems doubtful that this ratio will soon be achieved. In 1970, there were still less than two technicians for every specialist,[29] and even if the education goals of the Ninth Five-Year Plan are met, the situation will not be vastly improved.

As the Soviet economy relies more heavily on qualitative improvement in manpower, low productivity among specialists becomes increasingly important. Measures to increase the efficiency of specialists already in the labor force are generally beyond the scope of the education system as it is presently constituted. The education system can, however, either train a greater number of specialists or raise the qualifications of the specialists currently being trained. It seems that the latter course of action is being taken. While the growth of enrollment in specialized secondary schools, higher educational institutions, and graduate schools has dropped off, increased attention is being given to broadening the scope of specialist training and to increasing the qualifications of instructors in these institutions. However, in view of the slower growth in overall educational attainment of the Soviet population, unless this program to increase the efficiency of high quality manpower is overwhelmingly successful, education's contribution to Soviet economic growth in the future may well be less important than in the past.

Appendix

Abstracts of Major Education Decrees Since 1965[30]

On Measures for Expanding the Instruction of and Employing in the National Economy Young People Who Will Graduate From General-Education Schools in 1966 (*Pravda*, 6 February 1966)

[28] *Vestnik vysshei shkoly*, No. 6, June, 1963, pp. 3–6.
[29] *Narodnoye obrazovaniye, nauka i kul'tura v S.S.S.R.*, p. 235.
[30] Two 1969 decrees listing the duties of the USSR Ministry of Education and the USSR Academy of Pedagogy have been omitted.

1. PROBLEM CITED

Revision of the 1958 education reform included a reduction of one year in the general secondary education school program. As a result, two classes of students, one from the tenth grade and the other from the eleventh grade, will graduate in 1966.

2. MEASURES TAKEN

a. Admissions of general education school graduates to higher and other educational institutions are to be increased.

b. Courses lasting from six months to a year will be organized by the Union-republic Councils of Ministers and the USSR ministries and departments to train secondary school graduates as skilled workers, with students paid at one-half the base wage scale for their future occupations.

c. Efforts will be made to strengthen on-the-job training programs.

d. Union-republic Councils of Ministers are to make provisions to ensure the prompt employment of those youths who are unable to continue their studies without going to work.

e. A quota of jobs equal to 0.5% to 10% of the total number of workers and employees of enterprises and organizations will be reserved for minors.

f. Output norms for new workers under 18 years old may be reduced as much as 20%.

g. The Central Committees of the Communist Parties of the Union republics and the Union-republic Councils of Ministers will set up commissions for the job placement of young people.

h. The enterprise or organization is obliged to ensure a new job for any worker under 18 who is relieved from his job for any reason.

i. The trade unions are to ensure strict enforcement of the laws protecting young workers.

On Measures for Improving the Training of Specialists and Perfecting the Guidance of Higher and Specialized Secondary Education in the Country (*Pravda*, 9 September 1966)

1. PROBLEMS CITED

a. The Ministry of Higher and Specialized Secondary Education does not work systematically to raise the qualifications of instruction at educational institutions.

b. The Ministry fails to publish the necessary volume of textbooks.

c. Higher educational institutions with highly qualified scientific staffs are not concentrating on the most pressing national problems.

2. MEASURES TAKEN

a. Special attention is to be paid to raising the level of social-science instruction and to staffing social science departments with highly qualified instructors.

b. A number of higher educational institutions have been transferred to the direct jurisdiction of the USSR Ministry of Higher and Specialized Secondary Education to write textbooks and to prepare study aids.

c. The Ministry is charged with state inspection of all the country's higher educational institutions.

d. Because of the higher quality of instruction in full-time programs, day instruction in higher and specialized secondary education institutions will continue to be developed.

e. Universities and other higher education institutions with the most qualified instructional staff and modern laboratory facilities will organize facilities for increasing the qualifications of higher school instructors.

f. Permanent higher pedagogical courses will be organized in 1967 in the USSR Academy of Pedagogy to raise the qualifications of instructors in pedagogical disciplines.

g. Managers of enterprises. higher schools, and research organizations are obliged to provide higher school instructors with a period of on-the-job familiarization with technology and production.

h. It is proposed that well-qualified specialists from the Academy of Sciences and branch research and design organizations teach in higher educational institutions.

i. Supplementary staffs of professors and instructors are to be established by the Ministry at the 25 leading higher educational institutions so as to lighten the teaching load of scientists in research.

j. Bonuses will be granted to professors and instructors for creating and applying new technology.

k. Higher educational institutions are permitted to spend 75% of their profits from contract work on expanding their own facilities.

l. Specialized secondary educational institutions will be constructed and equipped through allocations to ministries and departments whose specialists are being trained.

m. A number of measures have been outlined for supplying higher schools with special instructional and scientific equipment.

On Measures for Further Improving the Work of the General Education Secondary School (*Pravda*, 19 November 1966).

1. PROBLEMS CITED

a. Union-republic Ministries of Education are not taking proper measures to overcome the breach between curricula and the current level of scientific knowledge.

b. Schoolchildren are being overloaded with schoolwork.

c. Shortcomings occur in the preparation and refresher training of teachers and other education workers.

d. Pedagogical research institutes are slow to address the problems of public education.

e. Funds are not used properly to reinforce the schools' material-instructional base.

2. MEASURES TAKEN

a. The introduction of universal secondary education for the young generation will be basically completed by 1970.

b. The USSR Ministry of Education and the Union-republic Ministries of Education are charged with the development of curricula which will bring the content of education into line with developments in science, technology, and culture but will not overload students with school work.

c. The transition of secondary schools to the new curricula begun in the current academic year is to be basically completed by the 1970–71 academic year.

d. Schools may offer elective lessons beginning in the seventh grade to develop the students' interests in the natural sciences—including physics and mathematics—and the humanities.

e. The maximum class size for general education schools is 40 students in grades one through eight and 35 students for grades nine and ten.

f. Regular vocational orientation will be conducted to familiarize schoolchildren with various branches of the economy and with diverse occupations.

g. A certain number of ninth and tenth grade courses offering more profound theoretical and practical study of mathematics and computer technology, physics and radioelectronics, chemistry and chemical technology, biology and agrobiology, and the humanities are permitted.

h. It is proposed that the diversion of school children, teachers, and school administrators from their immediate responsibilities for agricultural and other work not directly connected with the educational process not be permitted.

i. Leading scientists and experienced teachers must be enlisted to write high-quality textbooks and study aids for students and methodology manuals for teachers.

j. The USSR Ministry of Education is assigned to work out a draft statute on the general education secondary school.

On Improving the Training of Scientific Cadres (*Izvestiya*, 26 November 1967)

1. PROBLEMS CITED

a. Research institutes and higher educational institutes are not selecting promising students for graduate study in the sciences.

b. Dissertations are often late; some are low in quality and do not contain material useful to science or practice.

c. The plans for the number of graduate students is consistently underfulfilled in certain branches of science.

d. The ministry awards academic degrees for work with no scientific or practical value.

e. Ministries and departments do not exercise sufficient control over higher educational institutions and research institutes.

2. MEASURES TAKEN

a. Executives of enterprises, research, and design organizations and higher educational institutions may set up classes for specialists who are preparing for candidate or entrance exams.

b. To raise the quality of dissertations, preference in enrollment for graduate study will be given to specialists who have passed candidate exams.

c. Executives of research institutes and higher schools are to intensify control over teacher training and accreditation.

d. Enterprises, institutions, and organizations having an interest in research results should help evaluate dissertations.

e. Remote research institutes and higher educational institutions are to be strengthened by sending highly qualified students to work in them.

On Measures for Further Improving the Training of Skilled Workers in the Educational Institutions of the Vocational-Technical Education System (*Pravda*, 17 April 1969)

1. PROBLEMS CITED

a. The level of training of skilled workers in vocational-technical education institutions lags behind the economy's growing demands. A secondary education has become a necessity for the preparation of skilled workers in the more complicated occupations.

b. There are substantial shortcomings in vocational instruction, and many ministries and departments fail to show the proper concern for strengthening the educational and material facilities of the schools.

2. MEASURES TAKEN

a. The USSR Council of Ministers' State Committee for Vocational-Technical Education, the Central Committees of the Union-republic Communist Parties, and the Union-republic Councils of Ministers are charged with eliminating existing shortcomings in the work of vocational-technical educational institutions and adopting measures for improving the quality of worker training.

b. Vocational-technical educational institutions will gradually be converted into vocational-technical schools offering a three to four year course of instruction encompassing vocational training and a secondary education. Graduates of these schools will be issued certificates of vocational proficiency and completion of secondary education.

c. Admissions procedures for vocational-technical schools will be examined to ensure that new students will be recruited from the graduating classes of the eighth grade. In addition, technical schools will be further developed to train general education secondary school graduates as skilled workers.

d. Evening vocational-technical schools for training production workers and improving their skills will be further developed.

e. The publication of textbooks and teaching aids for use in the vocational-technical education system will be increased.

f. To strengthen control over the quality of training provided for skilled workers, the USSR Council of Ministers' State Committee for Vocational-Technical Education is charged with making state inspections of all educational institutions that train workers, regardless of their department affiliations.

g. Editors of central and local newspapers and magazines affiliated with ministries and departments should improve the printed and oral propaganda of vocational-technical education.

h. Steps should be taken to staff vocational-technical schools with teachers having a higher education and with skilled production instructors with either a specialized secondary or higher education.

i. The Union-republic Councils of Ministers, the USSR ministries and departments, and the USSR Council of Ministers' State Committee for Vocational-Technical Education should ensure that the network of vocational-technical educational institutions is expanded in line with the development of the national economy's branches and is rationally distributed among the economic regions of the country.

j. Measures are envisaged for supplying vocational-technical educational institutions with up-to-date equipment, instruments, and mechanisms.

On the Organization of Preparatory Departments at Higher Educational Institutions (*Pravda*, 6 September 1969)

1. PROBLEM CITED

Enterprises, organizations, collective farms, and state farms have not sent enough advanced production workers to higher educational institutions.

2. MEASURES TAKEN

a. Preparatory departments are being established at higher educational institutions and at enterprises, construction projects, and farms to prepare students for entrance into higher educational institutions.

b. Persons with a secondary education who are production workers with at least one year's experience or who have been discharged from the armed forces are eligible.

c. Higher educational institutions, enterprises, construction projects, farms, etc., will provide all facilities and supplies for these preparatory departments.

d. Students will be paid by the organizations that send them at the same rate as first-year students in higher educational institutions.

e. Instructors will be drawn from higher and specialized secondary educational institutions.

Statutes of the Secondary General Education School (*Uchitelskaya gazeta*, 15 September 1970)

1. MAJOR PROVISIONS

a. The main tasks of the secondary general education school are to give students a general secondary education that corresponds to the present-day demands of social, scientific, and technical progress, to impart to students a sound knowledge of the principles of science and the ability to enlarge this knowledge on their own, and to prepare students for the conscious choice of an occupation and for vigorous labor and public activity.

b. All children who have reached school age receive free instruction in the general education school. Students are given the opportunity to receive instruction in their native language; however, instruction in the Soviet school rules out any kind of religious influence.

c. The period of instruction in the secondary general education school is ten years, although an eleven year period of instruction may be established for schools where instruction is not conducted in the Russian language. Evening and correspondence secondary general education schools are established with a three year period of instruction: grades nine, ten, and eleven.

d. Beginning in the seventh grade, elective courses are offered to deepen the students general knowledge and to develop his interests and abilities.

e. The number of students per classroom in general education schools is not to exceed 40 in grades one through eight or 35 in grades nine and ten.

f. Students who receive excellent marks in all subjects and have exemplary conduct are awarded commendations. Students who have unsatisfactory marks for the year in no more than two subjects receive summer assignments, while students who receive unsatisfactory marks in three or more subjects will not advance to the next grade. Students who have studied for two years in the same grade and have not passed may be dismissed from school.

g. Individuals who have completed eight grades receive a certificate which gives them the right to enter the ninth grade of a general education school, a specialized secondary school, or a vocational-technical school.

h. Individuals who have completed a secondary general education school receive a certificate which gives them the right to enter a higher educational institution, a technical school, or a specialized secondary school with an abbreviated period of instruction.

i. Students in graduating classes who have an unsatisfactory mark in conduct for the year are not allowed to take final examinations until they present a character reference, within the ensuing three years, from their place of work.

j. Students are not to be excused from lessons in order to fulfill public assignments or to take part in sports and other activities.

k. The principal of the school, among his other duties, organizes the vocational guidance of students.

On Further Improving the System of Vocational-Technical Education (*Pravda*, 29 June 1972)

1. PROBLEMS CITED

a. The tasks set by the 24th Party Congress for the development of the national economy and the technical re-equipment of production require a further increase in the quality of the training of skilled workers.

c. New curricula are to be prepared during 1972–74 for the secondary vocational training of young people and the formation of worthy reinforcements for the working class. But there are serious omissions in the work of the vocational-technical schools. Instruction does not always reflect the changes in the content of workers' labor.

2. MEASURES TAKEN

a. The secondary vocational-technical school will be expanded as the most promising method for the training of young reinforcements for the working class.

b. Technical schools are also to be developed to provide workers' skills to young people who have graduated from a secondary general education school.

c. New curricula are to be prepared during 1972–74 for the secondary vocational-technical schools, and new textbooks and teaching aids prepared, reflecting the latest achievements of science and technology.

d. The USSR Council of Ministers' State Committee for Science and Technology and the State Vocational-Technical Education Committee are instructed to provide teaching staffs and pupils with scientific and technical information about developments in the various branches of the national economy.

e. Foremen and teachers working in vocational-technical schools are to receive advanced training, and the schools' engineering and pedagogical personnel are to be recertified at least once very five years.

f. Media editorial boards are called upon to depict more broadly the opportunities in vocational-technical education for young people to acquire skills and improve their general education.

On Completing the Transition to the Universal Secondary Education of Young People and the Further Development of General Education Schools (*Pravda*, 25 June 1972)

1. PROBLEMS CITED

a. An inadequate job is still being done of introducing new methods of instruction and of raising the quality of work in general education schools.

b. The training of teachers is insufficiently coordinated with the practice and needs of today's general education school.

2. MEASURES TAKEN

a. The USSR Ministry of Education and the Union-republic Councils of Ministers are instructed to complete the transition to universal secondary education and to raise the quality of instruction in general education schools.

b. The introduction of new study plans in all school courses is to be completed by 1975. Based on these study plans, new textbooks and instruction aids which reflect the present state of science and production are to be prepared.

c. Subjects taught in school are to more closely reflect the principles of modern production.

d. The vocational guidance of schoolchildren is to be ensured throughout the entire period of instruction.

e. The Union-republic Councils of Ministers are instructed to expand the network of evening schools at enterprises where young people work.

f. The regular certification of teachers in general education schools will be introduced to stimulate an increase in the qualifications and creative initiative of instructors.

g. The USSR Academy of Pedagogy has been instructed to prepare recommendations regarding methods to raise the scientific level of instruction and to determine the most effective methods of vocational guidance.

h. The quality of published materials is to be improved.

On Measures for the Further Improvement of Higher Education in the Country (*Pravda*, 30 July 1972)

1. PROBLEMS CITED

a. The level of the theoretical and professional knowledge possessed by the graduates of certain higher schools does not correspond to the growing requirements of science and production.

b. Curricula and textbooks do not reflect the latest achievements of science and technology.

c. High demands are not always made on students with respect to the quality of their studies and part-time programs of higher education need improvement.

d. Many higher educational institutions have weak ties with industrial and agricultural enterprises and research institutions and do not devote the necessary attention to solving urgent scientific and technical problems.

2. MEASURES TAKEN

a. In order to improve the guidance of the country's higher educational institutions, a Council on Higher Schools is created under the USSR Ministry of Higher and Specialized Secondary Education. The Council is called upon to recommend methods to improve instructional and research work in the higher schools and to examine the long-range planning of specialist training and the distribution and utilization of specialists.

b. The USSR Ministry of Higher and Specialized Secondary Education, in conjunction with the USSR Academy of Sciences, is instructed to improve the higher education curricula by 1974 by intensifying the study of general-scientific disciplines, management engineering psychology, and electronic-computer technology, paying special attention to the training of specialists with a broad range of knowledge.

c. The list of specialists in evening and correspondence programs is to be revised, and departments are to be reinforced with highly qualified instructors.

d. Preparatory divisions of higher schools are to be promoted as an important form of recruiting students from among young workers.

e. Textbook and teaching aids, especially in the newest areas of science and technology, are to be prepared.

f. The graduates of higher educational institutions, for the purpose of acquiring the necessary practical skills, are to take up to one year's probationary training at relevant enterprises or organizations.

g. To raise the level of instruction in higher schools, the USSR Ministry of Higher and Specialized Secondary Education is instructed to work out a new procedure for hiring professors which reflects the demand for instructors with higher qualifications, to introduce a probationary period of one year for instructors at higher educational institutions, and to expand the practice of assigning qualified teaching personnel to higher schools in remote parts of the country.

h. The training of the teaching staff for higher educational institutions specializing in the humanities is to be expanded and improved.

State Five-Year Plan for the Development of the USSR National Economy For the Period 1971–1975 (*Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaystva S.S.S.R. na 1972–1975 gody*, 1972)

1. MAJOR EDUCATION GOALS

a. Continued progress toward the goal of universal secondary education for young people in all localities will be made. By the end of the 5-year period at least 90–95% of adolescents graduating from 8-year general educational schools will obtain secondary education as against 80% in 1970. In order to achieve this task, there are plans to carry out a broad program to build new school buildings, to strengthen the material facilities of schools, particularly in rural localities, to furnish them with up-to-date classroom equipment, and to ensure a further rise in the level of teaching and training in the school.

b. The transition to new syllabi and curricula is to be completed; this is a very important requisite for a further rise in the level of education to meet present-day requirements. The schools will have a full supply of textbooks which will not be changed so frequently.

c. The vocational guidance of students will be intensified in accordance with the national economy's needs for skilled personnel, and there will be a rise in the quality of training and the qualification level of teachers.

d. The network of schools with extended day programs will continue to develop; the number of students in them will increase by approximately 1.7 million during the 5-year plan period, and in 1975 will be about 7 million—meeting the demand for these educational and child-care institutions.

e. In 1975, 2.6 million persons will graduate from secondary schools, as compared with 2 million persons in 1970. Approximately 400,000 of these will go on to higher educational institutions, 300,000 will go to secondary specialized educational institutions, and more than 250,000 will go to technical colleges in the system of vocational education. The other graduates of secondary schools will go to work in the national economy.

f. During the 5-year plan period the number of students in evening schools for young workers is to increase to 4.7 million, as compared with 3.7 million in 1970. A substantial improvement is planned in the organization and content of academic work in these schools. Also, more than 4 million youths will obtain secondary education without leaving their jobs; this is an appreciable contribution to the accomplishment of universal secondary education of young people.

g. The group of children in preschool establishments is to increase by 2.2 million, or 25% during the plan period.

h. The five-year plan envisages further development and improvement of higher and secondary specialized education. There is no need for any substantial increase in enrollment in higher and secondary specialized educational institutions in a number of specilizations. However, there is still some shortage of engineers specializing in power engineering and construction. certain specialities having to do with machine-building, radio engineering and communications, and calculator and computer engineering. The training of specialists in the construction, radio engineering, and power engineering specializations will increase, as will the training of specialists for the rapidly growing branches of production and the service sphere. The training of specialists in the new field of science and in the introduction and operation of automatic control systems will increase considerably. Priority is to be given to furnishing specialists in agricultural production and related branches relevant to fulfillment of the decree of the July (1970) Plenum of the CC CPSU concerning more rapid development of agriculture.

i. Admissions to higher and secondary specialized educational institutions will be increased as follows:

	1965	1970	1975 Plan
	[Thousand students]		
Admissions to:			
Higher education institutions	846.9	904.4	977
Of which the number in full-time programs	377	499	582.5
Secondary specialized schools	1,097.6	1,336.1	1,453.2
Of which the number in full-time programs	579.7	834.7	932.9

j. Full-time programs will increase to 60% of total enrollment in higher education institutions and 64% of total enrollment in secondary specialized educational institutions by 1975. About 9 million specialists will be trained in these educational institutions.

k. During the Ninth Five-Year Plan the country's national economy will receive about 4 million engineers and technicians, more than 900,000 agricultural specialists, 900,000 physicians and other medical workers, and 1,200,000 teachers and workers in cultural and educational institutions.

l. Much attention will be paid to improving the system for training and retraining production workers and high-level management personnel.

m. The volume of capital investments to build higher and secondary specialized educational institutions, to be implemented for the branch entitled "Education," will amount to 800 million rubles, and if the share of branch ministries and departments is taken into account it will be approximately 900 million rubles. In addition, capital investments to build higher educational institutions will be allocated by ministries which have jurisdiction over higher education schools in "Agriculture," "Public Health," "Transportation," and "Communicaitons." The country's higher education schools are being replenished with the most recent technical equipment for teaching, including electronic computers.

n. The material facilities for teaching at secondary specialized educational institutions will be expanded, as in the past, from funds allocated to development of those branches of the national economy for which specialists are trained in those educational institutions.

o. Scholarships are to be increased for higher education students and students of specialized secondary schools, and the number of scholarship students is to be enlarged. The housing and other living conditions of students of higher and secondary specialized educational institutions will also be considerably improved, as will their medical care.

Part VII. FOREIGN ECONOMY

U.S.-SOVIET COMMERCIAL RELATIONS*

By EDWARD T. WILSON, DAVID K. KATZ, SUZANNE F. PORTER, BONNIE M. POUNDS, *and* GILBERT M. RODGERS

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FIGURES

I. INTRODUCTION

On October 18, 1972, the United States and the Soviet Union concluded a series of commercial agreements representing a major effort on the part of both governments to reach a broad range of understandings on matters relating directly to the expansion of trade.

More than a product of fortuitous circumstances, this series of accords was the result both of a long history of commercial contact between the two countries and of intensive effort on the part of

*Dr. Wilson wrote the section relating to the historical background of U.S.-Soviet commercial relations prior to 1971. Mr. Katz contributed the section concerning the negotiations which began in 1971. Suzanne Porter prepared the section on the 1972 commercial agreements. Bonnie Pounds wrote the final section on the U.S.-U.S.S.R. Commercial Commission and edited the chapter. Dr. Rodgers coordinated the project for the Bureau of East-West Trade of the U.S. Department of Commerce.

United States and Soviet officials to implement the objectives of the May, 1972, Moscow Summit Conference.

The first section of this chapter recounts the historical progression of events leading up to the signing of the commercial agreements. In the current wave of enthusiasm over commercial contacts with the U.S.S.R., many Americans have tended to forget that trade with Russia has firmly based historical origins.

The second section summarizes the major provisions of the U.S.-U.S.S.R. agreements reached in October of 1972. Specifically, the agreements deal with the settlement of outstanding debts, the provisions for satisfactory shipping arrangements, and the establishment of a legal and logistical framework for commercial transactions.

The final section underlines the principal institutional mechanism through which the negotiations have been conducted—the Joint U.S.-U.S.S.R. Commercial Commission. Established at the time of the Moscow Summit, this Commission is charged with the responsibility for laying the groundwork for constructive U.S.-Soviet commercial exchanges in the future.

II. U.S.-Soviet Commercial Relations: Historical Background

The recent commercial agreements between the United States and the U.S.S.R. have evolved in a new atmosphere of political detente. Given the virtual absence of trade between the two countries during the height of the Cold War and the attitudes of hostility which lingered for so many years thereafter, it is easy to interpret the current expansion of trading relationships as a totally unprecedented development. Far from a new phenomenon, however, this expansion is grounded in a long history of commercial contact. Not only is a knowledge of this history interesting for the light it sheds on the early configuration of Soviet-American economic relations, but it is highly useful for an understanding of many of the events which have occurred since President Nixon's historic Summit Conference of May 1972.

The Prewar and World War II Periods

Significant commercial contacts between Russia and the United States go back to the early history of this country. As long ago as 1811, Russia was taking about one-tenth of U.S. exports and the United States, in turn, was heavily reliant upon imports of Russian naval stores. In 1832 the U.S. Government successfully obtained from Russia a formal Treaty of Navigation and Commerce which granted both countries most-favored-nation status.[1] Later, in 1911, this trade agreement was abrogated by the United States in an effort to pressure the Czarist Government into modifying its restrictive policy on the issuance of visas to Jews. This "diplomatic lesson in human rights delivered by the Yankees under conditions of cloudless peace" did not, however, result in a change in Czarist policy.[2]

By the eve of the Bolshevik Revolution Russia had become an important customer for U.S. industrial and agricultural equipment. American firms such as the Pullman Company, International Harvester, Singer, Westinghouse Airbrake, and National City Bank (the

[1] A full text of this treaty appears in Mikhail V. Condoide, *Russian-American Trade* (Columbus, Ohio, 1946), pp. 121–128.
[2] M. Laserson, *The American Impact on Russia* (New York, 1950), p. 340.

predecessor of the First National City Bank) had succeeded in capturing significant shares of the Russian market. Immediately following the Revolution, Americans became actively involved in rehabilitating the Russian economy. Through Herbert Hoover's American Relief Administration the U.S. Government spent some $20 million worth of Congressional appropriations primarily in the distribution of American grain to famine-stricken Russian peasants.

Russian-American trade during the 1920's did not reach important levels, but a number of profitable business transactions were concluded and institutional vehicles were established for the expansion of commercial exchanges. American investors, some of whom are prominent in U.S.-Soviet trade today, participated in concessions granted by the Soviet Government to foreign capitalists during the early phases of Lenin's New Economic Policy (NEP). For example, Armand Hammer, Chairman of the Board of Occidental Petroleum and an individual well-known for his recent initiation of a series of commercial agreements with the Soviet Government, established an asbestos mine and a successful pencil-manufacturing operation in the U.S.S.R. during this period. At the same time, other concessions, such as that owned by the Harriman interests in the Caucasus, brought American investment in projects for the exploitation of Soviet natural resources.

New York City became the site for Soviet purchasing commissions. It also served as the headquarters of Amtorg, an agency representing most Soviet trading organizations, and of the American-Russian Chamber of Commerce, an organization which gathered and disseminated information, issued regular bulletins, and arranged for meetings between persons engaged in the conduct of Soviet-American trade.

Upon Stalin's assumption of power in the late twenties, the pragmatic toleration of foreign capitalist enterprise under Lenin's NEP was abandoned in favor of dogmatically-oriented socialism. In spite of this sharp redirection of Soviet foreign and domestic policies, the American contribution to the Soviet economy increased markedly during the first decade of Stalinist rule. For example, U.S. engineering services and technological know-how constituted a critical ingredient in the success of Stalin's First Five-Year Plan (1929–33). One U.S. firm alone, Albert Kahn Construction, reportedly designed nearly 600 plants throughout the country. DuPont rendered key assistance in the construction of factories for the fertilizer industry, and General Electric became heavily involved in the planning of the Soviet electric power industry. Americans such as Ralph Budd, Thomas Campbell, and Colonel Hugh Cooper won acclaim in the U.S.S.R. for their respective services in advising on railroad construction, mechanized farming techniques, and large-scale dam building.

Perhaps no single American was more influential than Henry Ford, who had come to the conclusion well in advance of most of his colleagues in American industry that the Soviets had created a permanent regime and were destined to achieve significant economic progress.[3] By 1927 Ford had produced 85 percent of all tractors in use in the U.S.S.R. During the ensuing years of the first Five Year Plan, Ford engineers laid the foundations for the Soviet automotive industry.

[3] Henry Ford (as interviewed by William A. McGarry), "Why I Am Helping Russian Industry," *Nation's Business*, XVIII (June, 1930), pp. 20–23. So important was Ford's work that the term *fordizatsiia* has become synonymous with modernization in the Russian language.

During the Depression, when the American economy was experiencing the worst economic crisis in its history, sales to the Soviet Union underwent a sharp increase. By 1931 the Soviet market was absorbing nearly two-thirds of all U.S. exports of agricultural equipment and power-driven metal-working machinery. The Soviet Government, by placing such large orders in the United States, won powerful support for its goal of U.S. diplomatic recognition. When recognition came in 1933, the enthusiasm of the American business community for Soviet trade became even more pronounced. The following year, the Export-Import Bank was established for the express purpose of financing trade with the Soviet Union. In 1935 the first Soviet-American trade agreement was signed, granting the U.S.S.R. most-favored-nation treatment in exchange for a commitment to purchase a fixed amount of U.S. products each year.

This trade agreement was renewed annually for five successive years and served as the basis for U.S.-Soviet commercial exchanges until the signing of the Lend Lease agreement in 1942. At this point, American exports to the Soviet Union increased to an annual level of nearly $2.5 billion. It is, of course, improper to regard this massive infusion of wartime materiel as a natural development in the evolution of trading relations between the two countries. American goods and services did, however, make a substantial contribution both to the Soviet war effort and to the reconstruction of the Soviet economy in the postwar period. Particularly in the transportation sector, thousands of Russian engineers and future plant managers gained a first-hand exposure to American products and were thereafter predisposed to view the United States as an industrial and technological leader. Had not the Cold War with it attendant disagreement over Lend-Lease repayment terms intervened after 1947, Lend Lease shipments perhaps would have served as the foundation for a major trading relationship between the United States and the U.S.S.R. in the post-war years.[4]

The Cold War Era (1949–1959)

The Cold War produced an immediate and negative effect on trading relationships between the two countries. In 1948, countries which were members of the International Monetary Fund and the World Bank were exempted from the restrictions of the Johnson Act, a measure which prohibited private loans to countries in default on their debts to the United States. Since none of the communist countries were members of the IMF or the Bank, the credit restrictions remained applicable to Eastern Europe. With the beginning of the Cold War in 1947 controls on exports to communist countries were imposed. This step was followed in 1949 by the enactment of the Export Control Act, which imposed a comprehensive system of controls over U.S. exports to communist countries. In 1951 the Trade Agreements Extension Act revoked MFN status for communist states. In the same year a ban was issued on the import of seven specific types of fur skins originating in the U.S.S.R. and China.

During the Korean War, a strong effort was made by the American Government to prevent the export of Western goods which might specifically contribute to the military strength of the Soviet bloc. In an attempt to promote an embargo on such strategic goods, as well as

[4] The same supposition is also supported by the sharp rise in U.S. imports from the U.S.S.R. in the period immediately following World War II—notably in various kinds of undressed furs and in America's traditional purchases of manganese and chrome ores and platinum group metals.

to control more closely other exports destined for "nations threatening the national security of the U.S." (the Soviet Union was the only country singled out in this context), Congress in 1951 adopted the Mutual Defense Assistance Act, popularly known as the Battle Act. Also in line with this strategy, the United States, its NATO allies (excluding Iceland), and Japan joined in the formation of the Coordinating Committee (COCOM). This organization, with permanent Paris headquarters, had responsibility both for standardizing the lists of prohibited items and for establishing common policies on export control.

The Thaw (1959–1971)

The first tentative step toward an expansion in U.S.-Soviet trade in the postwar era was taken in 1956 when President Eisenhower authorized the decontrol of some 700 items in 57 commodity categories for export to the U.S.S.R. and Eastern Europe. Further initiatives were taken in 1959 when Soviet Party Chairman Khrushchev and President Eisenhower, in the course of the "Camp David" Summit talks, explored the subject of trade between their respective countries. They exchanged lists of commodities with commercial potential and discussed specific problems such as the definition of strategic goods. These initial efforts brought about a prompt increase in the export of American manufactured goods, including consumer durables.

During the Kennedy Administration, the momentum for increased U.S.-Soviet trade continued to build. Although under the terms of the 1962 Trade Expansion Act the President of the United States was denied authority to offer MFN status to communist countries, the Kennedy Administration did effect a reinterpretation of the Johnson Act to permit medium-term credits linked to U.S. export transactions. This step, together with an agreement with U.S. longshoremen allowing 50 percent of export cargoes to travel in non-U.S. bottoms, paved the way for the $110 million wheat sale to the Soviet Union in 1964. In addition, the renewed interest in trade sparked by this and other transactions led the Senate Foreign Relations Committee to conduct a series of hearings on East-West trade in 1964. A survey of the views of businessmen published by the Committee revealed both a widespread interest in the expansion of commercial relations and an emerging consensus that American exporters should not be subjected to controls more restrictive than those applicable to their free-world competitors.[5]

The tendency of Western Europe and Japan to limit their controls to COCOM items placed U.S. businessmen in an increasingly disadvantageous position. In an attempt to develop a more rational approach, the Johnson Administration in October, 1966, removed a large number of nonstrategic items from the U.S. control list. In addition, its desire to "build bridges with the East" led the Administration to conclude a civil air agreement with the U.S.S.R. (permitting flights by Aeroflot and Pan American between Moscow and New York) and to sponsor the "East-West Trade Relations Act of 1966." This legislation would have authorized the President to extend MFN treatment to communist countries in return for reciprocal concessions, to revoke discriminatory bans on specific Soviet imports, and "to provide a framework helpful to pri-

[5] Senate Committee on Foreign Relations, 88th Congress, 2nd Session (1964), *East-West Trade: A Compilation of Views of Businessmen, Bankers, and Academic Experts.*

vate U.S. firms conducting business relations with communist state-trading agencies by instituting regular government-to-government negotiations with individual communist countries." [6] By the time this measure was introduced in Congress, however, the intensity of sentiment over the Vietnam conflict was sufficient to bring about its defeat.

Although the East-West Trade bill was reintroduced—again unsuccessfully—in 1969, the failure of this proposal did not spell the end of efforts to liberalize restrictions on trade with the Soviet Union. In the first Nixon Administration the business community spoke out with new conviction for a more liberalized Export Control Act. The result was the "Export Administration Act," whose stated purpose was to favor the expansion of peaceful trade with the U.S.S.R. and other Eastern European countries. The enactment of this measure, together with the concomitant increase in the U.S.-Soviet trade (U.S. exports to the U.S.S.R. in 1969 nearly doubled over the preceding year, surpassing the $100 million mark for the first time since the wheat sale of 1964), set the stage for the initiatives taken by Secretary of Commerce Maurice Stans in the course of 1971.

On the Soviet side of the commercial equation the 1960's were characterized by significant changes away from autarky and toward greater participation in commercial relations with the noncommunist world. Perhaps nowhere was this more apparent than in the directives of the 23rd Congress of the Communist Party of the Soviet Union in 1965 which stated clearly the need for an "international division of labor" and for "increasing substantially the volume of purchases in capitalist countries." Equally encouraging was Premier Kosygin's reference to the possibility of saving "hundreds of millions of rubles on scientific research work during the five-year plan" by purchasing Western industrial licenses.[7] Such thinking had a great deal to do with the overall formulation of Soviet economic plans for the 1970's and with the current Five Year Plan's specific accent on developing Soviet electronics, chemical, and consumer industries by relying upon Western technology.[8] In short, by the early 1970's Russians and Americans alike had generally come to recognize that, despite differences in political philosophy, there were tangible advantages to be gained by expanding commercial exchanges.

The New Era of Negotiations Beginning in 1971

STANS VISIT

A new era in U.S.-U.S.S.R. commercial relations began in November 1971 when Secretary of Commerce Maurice Stans led a U.S. delegation to the Soviet Union for the first official talks on expansion of trade and other commercial relationships.

Agreeing on the two countries' mutual desire to normalize their economic relationship, the Soviets indicated that, for full normaliza-

[6] H.R. 15212, 89th Congress, 2nd Session (1966).

[7] Joint Economic Committee, Subcommittee on Foreign Economic Policy, 90th Congress, 2nd Session (1968). *Soviet Economic Performance: 1966–67*, pp. 255, 257.

[8] See *State Five Year Plan for the Development of the U.S.S.R. National Economy for the Period 1971–75*, JPRS, September 7, 1972. Part I, pp. 53–54, which points out the need for expansion in trade relations with capitalistic countries and notes that "consideration is being given to mutually beneficient cooperation with foreign firms and banks in working out a number of very important economic questions associated with the use of the Soviet Union's natural resources, construction of industrial enterprises, and exploration for new technical solutions."

tion to occur, improvements in U.S. tariff terms (i.e. U.S. extension of MFN treatment to the Soviet Union), increased availability of commercial credit, and reduction of discriminatory shipping restrictions and export controls on some goods would be necessary. The Soviets wanted to see such changes embodied in a formal trade agreement, and indicated a willingness to make reciprocal concessions. They recognized the validity of the U.S. business firms' desire for more normal access to the U.S.S.R. market, better provisions for business offices and communications, travel rights, elimination of high Soviet tariffs, and removal of discrimination against U.S. products and technology. The Soviets appeared willing to negotiate these matters on a reciprocal basis.

Both sides realized that U.S. firms and Soviet agencies would need much practical experience in dealing with one another, but that, once such experience was gained, major transactions could be concluded if arrangements were made to trade U.S. technology and products (especially capital goods and feed grains) for Soviet raw materials. Soviet officials described in some detail the opportunities for U.S. collaboration with the U.S.S.R. in the extraction, processing and transportation of raw materials, and discussed the need for an agreement on legal, accounting, and other concepts for that purpose.

Throughout the meetings, the U.S. delegation was careful to explain to the Soviets that, while the U.S. Government would take whatever steps it deemed feasible in its national interest to improve the climate with Soviet traders, it would be up to the competitive initiative and judgment of individual U.S. firms to achieve the concrete progress that could then be reflected in rising trade figures.

The discussions were considered exploratory in nature and did not extend to negotiations. The only agreement concluded was one to create a joint U.S. Department of Commerce-U.S.S.R. Ministry of Foreign Trade fact-finding group to study such questions as product reviews of export opportunities in each direction and specific joint venture possibilities.

The mission found and developed a more favorable climate for two-way Soviet-American commercial relationships by identifying specific possible areas for future expansion, and set the stage for negotiations on ways to achieve two-way benefits. Upon returning to the United States, Secretary Stans felt optimistic: "My recent trip, including talks with people at many levels in the Soviet Union, convinced me that the Soviets have a real interest in further enlarging trade between our two countries."

MANZHULO VISIT

From January 6 to January 18, 1972, a series of low-key meetings was held in the Commerce Department in Washington between U.S. officials led by Assistant Secretary of Commerce for Domestic and International Business Harold B. Scott and a delegation from the Soviet Ministry of Foreign Trade, led by Deputy Minister A. N. Manzhulo. The talks emphasized long-term trade possibilities which would contribute significantly to the domestic economy of each country. They dealt principally with identification of Soviet commodities saleable in the United States, U.S. products which could be sold in the Soviet Union, procedures for market research and marketing in both coun-

tries, methods for facilitating the commercial transfer of technology between the two countries, the need for increased commercial representation in each direction, and the opportunities for participation by U.S. firms in major development projects in the U.S.S.R. During their visit, the Soviet delegation also met in New York with leaders of major U.S. business to discuss matters of mutual interest.

PATOLICHEV VISIT

Bilateral discussions on various aspects of the U.S.-U.S.S.R. economic relationship continued in May 1972 during the return visit to the United States by Soviet Minister of Foreign Trade Nikolai Patolichev as the official guest of Secretary of Commerce Peter Peterson.

There were more than 30 hours of working sessions held at the Department of Commerce in Washington. These discussions covered basic aspects of present and potential commercial relationships, including such major issues as settlement of outstanding Lend-Lease debts; potential levels of trade and the nature of possible trade agreements; most-favored-nation tariff provisions; extension of credit facilities including those of the Export-Import Bank; grain sales; and the possibility of the participation of U.S. private enterprise in the development and sale of Soviet raw materials and other goods.

The visit was marked by a meeting between President Nixon, Minister Patolichev, and Ambassador Dobrynin, at which the Secretary of Commerce and Senior White House officials were present.

MOSCOW SUMMIT

The real turning point in commercial relations between the United States and the Soviet Union was reached in Moscow in May of 1972. The foundation for creating a new pattern of Soviet-American trade was laid when President Nixon and Secretary General Brezhnev agreed upon "Basic Principles of Relations Between the United States of America and the Union of Soviet Socialist Republics." The Seventh Principle states that "the United States and the Soviet Union regard commercial and economic ties as an important and necessary element in the strengthening of their bilateral relations and thus will actively promote the growth of such ties. They will facilitate cooperation between the relevant organizations and enterprises of the two countries and the conclusion of appropriate agreements and contracts, including long-term ones."

Due to the complexity and the interrelationships of the problems involved, no specific agreements on trade were concluded at the Summit. However, the United States and the U.S.S.R. did agree on the establishment of a Joint Commercial Commission to lay the groundwork for constructive U.S.-Soviet commercial exchanges in the future. The Commission was charged with negotiating a comprehensive trade agreement which would include reciprocal MFN tariff treatment; governmental credit arrangements by both sides; reciprocal establishment of business facilities; and study of possible joint participation in the development of raw materials. A Lend-Lease settlement was also to be negotiated concurrently with such a trade agreement.

The agreements reached at the Summit constituted a framework of interlocking agreements on which to build a vested interest on both sides in improving bilateral relations.

III. U.S.-U.S.S.R. 1972 Commercial and Technical Agreements—Aims and Outcome

In the period following the Moscow Summit, the United States and the Soviet Union concluded a Grains Agreement, a series of commercial accords, and a number of agreements in the scientific and technological cooperation field. The Grains Agreement was signed in July and involved the sale of $750 million of U.S.-grown grains to the Soviet Union during the period August 1, 1972 through July 31, 1975.

The commercial accords were concluded at the 2nd plenary session of the Joint U.S.-U.S.S.R. Commercial Commission held in Washington in October. The October session resulted in the successful settlement of outstanding Soviet debts deriving from the Lend-Lease Agreement, a Maritime Agreement providing for satisfactory shipping arrangements, and a Trade Agreement establishing a legal and logistical framework for commercial transactions. Arrangements were also completed for reciprocal authorization of government credits.

October 1972 Commercial Agreements

Lend-Lease Agreement

BACKGROUND

Unsettled Soviet Lend-Lease obligations were a major deterrent to U.S.-Soviet commercial relations following World War II. The arrearages owed the U.S. Government by the U.S.S.R. fell into two main categories: Lend-Lease debt and "pipeline" debt.

Under the Lend-Lease Act of March 11, 1941, the United States supplied its Allies with material and services needed for the successful prosecution of World War II, including $10.8 billion to the Soviet Union. In negotiating settlements after the war, the United States sought payment only for Lend-Lease goods in the possession of other countries on V–J day, which were of a civilian type, useful in the peacetime economy of the recipient country.

The Soviets argued that Lend-Lease was not debt in the conventional sense; that goods provided them by the United States under the Lend-Lease program were, in fact, a contribution to a mutual war effort; and that they had paid in lives what the United States paid in war material. The Soviet Union lost more than 20 million lives in World War II.

With the Soviet Union having failed to provide an inventory of U.S.-supplied industrial equipment, supplies, and agricultural commodities still extant after conclusion of the war, the United States estimated that such goods worth $2.6 billion remained in Soviet custody, in addition to merchant ships and assorted watercraft.

When World War II came to an end, large quantities of civilian type of Lend-Lease industrial equipment and supplies and agricultural commodities, previously requisitioned by foreign governments, were still under allocation or in production or storage in the United States. Agreements providing for shipment of such goods became known as "pipeline" agreements.

In an agreement signed on October 15, 1945, the Soviet Government undertook to pay for "pipeline" deliveries, which ultimately totalled $222.5 million, in 22 annual installments, at an interest rate of 2⅜

percent per annum. The Soviet Union has been making annual payments on this account since 1954 but had also made deductions of about $93 million not recognized by the United States. These arrearages included compensation for damages allegedly resulting from the failure of the United States to complete certain deliveries, damages to Soviet commercial vessels in the port of Haiphong in North Vietnam, and other claims unrelated to Lend-Lease.

The United States continued to insist that the outstanding Lend-Lease debt be settled as a prerequisite for negotiating a trade agreement. In October 1972 the United States and the Soviet Union signed a series of economic and commercial accords which included settlement of the Lend-Lease debt.

BASIC PROVISIONS

The agreement settling outstanding Soviet Lend-Lease obligations provides for Soviet payment to the United States of at least $722 million, over the period ending July 2001. The settlement also included remaining amounts due on the "pipeline account" for Lend-Lease goods delivered to the Soviets immediately after World War II.

The payments will be as follows: ($12 million was paid on the date of the agreement) $24 million will be paid by July 1, 1973, and $12 million on July 1, 1975. The balance will be paid in equal annual installments ($24,071,429 for each of 28 installments, assuming the first such annual payment is on July 1, 1974) ending July 1, 2001. The exact total amount will depend upon when and how many of four allowable annual deferments are taken by the Soviets. If the Soviets were to take their four postponements early in the period, interest on the deferments could amount to as much as $37 million, making the total amount payable between now and 2001 equal to $759 million. Such deferments, if taken, will nonetheless be repaid by July 1, 2001, and will bear interest at the rate of 3 percent per annum.

However, beyond initial Soviet payments of $48 million by mid-1975, the implementation of the payments schedule is dependent on U.S. extension of MFN treatment to the U.S.S.R. The latter requires Congressional action.

Maritime Agreement

The U.S.–U.S.S.R. Maritime Agreement was signed on October 14, 1972. This Agreement represents another necessary link in the establishment of an expanding commercial relationship with the Soviet Union. Its basic objectives are, first, to expand the channels of maritime commerce between the two nations by opening reciprocally as many U.S. and Soviet ports as possible to calls by specified kinds of U.S.-flag vessels and Soviet-flag vessels; and, second, to afford to U.S.-flag vessels and Soviet-flag vessels the opportunity to participate equally and substantially in the carriage of all cargoes moving by sea between the two nations.

PORT ACCESS

Under the Agreement, forty ports in each nation are open to access by vessels of the other upon four days' advance notice to the appropriate authorities. The selection of ports was based on commercial considerations, reasonable reciprocity and protection of national security interests. Ports open to access by vessels of the other nation are listed in Figures 1 and 2 below. Entry of vessels to ports not specified in the Agreement will continue to be permitted in accordance with existing rules and regulations.

Maritime training vessels and hydrographic and other research vessels may enter the ports only for purposes of resupply, rest, crew changes, minor repairs and other services normally provided in such ports. The Agreement excludes vessels engaged in fishing or related activities (since these matters are covered by separate agreements) as well as warships or vessels carrying out state functions other than those mentioned above It is not intended to cover any liquefied natural gas (LNG) trade which may develop between the nations.

FIGURE 1.—*Ports of the United States of America open to calls upon notice*

1. Skagway, Alaska
2. Seattle, Washington
3. Longview, Washington
4. Corpus Christi, Texas
5. Port Arthur, Texas
6. Bellingham, Washington
7. Everett, Washington
8. Olympia, Washington
9. Tacoma, Washington
10. Coos Bay (including North Bend), Oregon
11. Portland (including Vancouver, Washington), Oregon
12. Astoria, Oregon
13. Sacramento, California
14. San Francisco (including Alameda, Oakland, Berkeley, Richmond), California
15. Long Beach, California
16. Los Angeles (including San Pedro, Wilmington, Terminal Island), California
17. Eureka, California
18. Honolulu, Hawaii
19. Galveston, Texas City, Texas
20. Burnside, Louisiana
21. New Orleans, Louisiana
22. Baton Rouge, Louisiana
23. Mobile, Alabama
24. Tampa, Florida
25. Houston, Texas
26. Beaumont, Texas
27. Brownsville, Texas
28. Ponce, Puerto Rico
29. New York (New York and New Jersey parts of the Port of New York Authority), New York
30. Philadelphia, Pennsylvania (including Camden, New Jersey)
31. Baltimore, Maryland
32. Savannah, Georgia
33. Erie, Pennsylvania
34. Duluth, Minnesota/Superior, Wisconsin
35. Chicago, Illinois
36. Milwaukee, Wisconsin
37. Kenosha, Wisconsin
38. Cleveland, Ohio
39. Toledo, Ohio
40. Bay City, Michigan

Source: Annex I, U.S.-U.S.S.R. Maritime Agreement of October 14, 1972.

FIGURE 2.—*Ports of the Union of Soviet Socialist Republics open to calls upon notice*

1. Murmansk
2. Onega
3. Arkhangel'sk
4. Mezen'
5. Nar'yan-Mar
6. Igarka
7. Leningrad
8. Vyborg
9. Pyarnu
10. Riga
11. Ventspils
12. Klaipeda
13. Tallinn
14. Vysotsk
15. Reni
16. Izmail
17. Kiliya
18. Belgorod-Dnestrovskiy
19. Il'ichevsk
20. Odessa
21. Kherson
22. Novrossiysk
23. Tuapse
24. Poti
25. Batumi
26. Sochi
27. Sukhumi
28. Yalta
29. Zhdanov
30. Berdyansk
31. Nakhodka
32. Aleksandrovsk-Sakhalinskiy
33. Makarevskiy Roadstead (Roadstead)
34. Oktyabr'skiy
35. Shakhtersk
36. Uglegorsk
37. Kholmsk
38. Nevel'sk
39. Makarov Roadstead
40. Poronaysk

Source: Annex II, U.S.-U..S.S.R. Maritime Agreement of October 14, 1972.

The Agreement does not involve any concessions in the policy of the United States with respect to ships which have called on Cuban, North Vietnam, or North Korean ports. Soviet vessels which have called on Cuba or North Vietnam will not be permitted to load or unload in U.S. ports government-financed cargoes such as grains sold on Commodity Credit Corporation credit terms.

FREIGHT RATES

The matter of freight rates is an important provision of the Agreement. Bulk cargo is shipped in world trade under charter rates which are set in competition with ships of nations with far lower costs than American ships. Under the Agreement, the two governments have worked out rate provisions for bulk cargo to be carried by U.S. vessels. For agricultural cargo the Soviet Union has also agreed to terms relating to unloading ships in the Soviet Union which are more favorable to the U.S. vessels than would otherwise apply in this trade. These special provisions for rates on agricultural cargo apply through June 30, 1973, by which time the parties will negotiate future rates.

The Agreement provides U.S. flag bulk carrying vessels with access to one-third of the 19 million tons of wheat and feed grain purchased by the Soviet Union. A special operating subsidy formula for ships engaged in this grain trade has been developed and a satisfactory rate structure negotiated with the Soviet Union.

EQUAL AND SUBSTANTIVE SHARING

The Agreement also provides that the national flag vessels of the U.S. and the U.S.S.R. will each have the opportunity to carry not less than one-third of all cargoes moving in whole or in part by sea between the two nations. The final third of the cargo is to be open for competition by all flags. The Agreement generated considerable controversy with the traditional maritime states which are concerned that the United States is embracing a bilateralist shipping policy. However, the Maritime Agreement responded to special circumstances and does not necessarily constitute a precedent.

FUTURE SIGNIFICANCE

The importance of this Agreement for the bulk carrying segment of the shipping industry is evidenced by the fact that in April 1972, before the Maritime Agreement was signed, 43 ships, aggregating about 1.4 million deadweight tons, were laid up for lack of employment. Today virtually no ships are in lay up for lack of cargo. Prior to the Agreement the amount of U.S. tonnage being laid-up was increasing. Industry sources had predicted that this year's laid up tonnage would exceed last year's figure. The Agreement averted this situation. As of March 1, 1973, 48 operating subsidy contracts covering 76 American-flag vessels have been approved, and 36 vessels covering 78 voyages have been fixed to carry over 2.7 million tons of grain to the Soviet Union. This means over 210,000 man days of actual seafaring employment. As a result of the Agreement, our bulk fleet is fully employed for the first time in several years.

The Soviets have announced large-volume sales of heating oil to the United States as a means of offsetting the cost of their U.S. grain purchases. United States flag ships are participating in the transport of this oil on return voyages after discharging grain in Black Sea ports.

The prospects look promising for the development of significant liner trade between the United States and the Soviet Union. A number of American manufacturing firms have already entered into trade discussions with the Soviet Union, and several U.S. liner operators have conducted talks with Soviet representatives concerning cargo-sharing arrangements.

Trade Agreement

The U.S. commercial policy objective in negotiating a Trade Agreement with the U.S.S.R. was to normalize U.S.-Soviet commercial relations and to create a comprehensive and clear framework within which private American firms could do business with representatives of the centrally-planned economy of the U.S.S.R.

The Trade Agreement and the accompanying series of arrangements between the United States and the Soviet Union signed on October 18, 1972, spell out guidelines in specified critical areas to facilitate the flow of trade. The Trade Agreement will enter into force upon the exchange of written notices of acceptance. These notices cannot be exchanged until after Congress has authorized extension of most-favored-nation (MFN) status to the U.S.S.R.

The Trade Agreement provides for:

(1) reciprocal granting of trade access equal to that granted to the most favored trade partner,

(2) protection against disruption of domestic markets,

(3) encouragement and facilitation of bilateral trade with the expectation that the total bilateral trade over the three-year period of the Agreement will at least triple the total bilateral trade in the period 1969–1971, which amounted to approximately $525 million,

(4) placement of substantial orders by the Soviet Union for U.S. machinery, plants and equipment, agricultural products, industrial products, and consumer goods,

(5) establishment of a U.S. Commercial Office in Moscow and a Soviet Trade Representation in Washington,

(6) availability of U.S. business facilities in the U.S.S.R. equivalent to those granted businessmen of other nations and availability of appropriate facilities in the United States for Soviet foreign trade and other organizations, and

(7) encouragement of third-country supervised arbitration in the settlement of commercial disputes.

Once the Trade Agreement enters into force, it will operate for three years unless extended by mutual agreement. To oversee and facilitate the implementation of the Agreement, the United States and the Soviet Union have committed themselves to work through the Joint U.S.-U.S.S.R. Commercial Commission established at the Moscow Summit in May, 1972.

The major provisions of the Agreement and of the arrangements for the reciprocal authorization of the government credit are discussed below.

MFN

The Soviet Union enjoyed most-favored-nation tariff treatment by the United States from 1935 to 1951, when it was withdrawn by the Trade Agreements Extension Act during the Korean War.

As a result, Soviet exports to the United States are subject to the high rate of the statutory rate of duty existing on July 1, 1934, compared with the substantially lower rates extended on a nondiscriminatory basis to non-communist countries. The United States is the only major industrial country which does not extend MFN to the U.S.S.R.

The U.S.S.R. maintains a two-column tariff schedule and in addition extends preferential treatment to developing countries. The United States is one of the few countries to which the higher, non-MFN Soviet tariff is applied. This higher tariff, however, does not represent the same kind of deterrent to imports into the U.S.S.R. as it would to imports into a free market economy.

The October 1972 Trade Agreement provides that each country will apply to the other country treatment no less favorable than that accorded to like products originating in or exported to any third country in all matters relating to customs duties and charges.

It is difficult to project what quantitative effects the extension of MFN to the U.S.S.R. would have on imports to the United States. On the basis of the present composition of Soviet exports to the United States, the impact would be limited. However, there are a number of Soviet exports to other Western countries which the U.S.S.R. does not sell to the United States because of the tariff differential, for example, certain chemicals and raw materials.

MFN provisions and the entire trade agreement cannot enter into force until enabling legislation is passed by Congress. During the U.S.–Soviet trade negotiations, the U.S. Government undertook a commitment to seek such legislation from the Congress. The Trade Reform Act of 1973 was submitted to the Congress on April 10, 1973. It includes provisions designed to authorize MFN treatment and to implement other provisions of the U.S.–Soviet Trade Agreement. If MFN is not granted to the U.S.S.R. by 1975, Soviet payments under the Lend-Lease Agreement will be suspended.

Market Disruption

BACKGROUND

Special problems arise in attempting to apply antidumping and countervailing duty principles to a state-trading monopoly. In a centrally planned economy where production and resource allocation are controlled by administrative decisions, there is no necessary link between economic costs and prices. Moreover, supporting cost data is often impossible to obtain. A state-trading economy can arbitrarily determine the elements and magnitudes of the costs that are attributable to the production of certain goods. For example, it appears that the costs of invested capital, rents, and in-country transportation are sometimes not included in either the domestic or export price of the product. In constructing anti-dumping and countervailing duty investigations, the U.S. Treasury Department must take these cost factors into account in determining whether import restraint is warranted.

Prior to the signing of the Trade Agreement, some elements in the United States expressed apprehension that a flood of imports from the Soviet Union would occur if MFN treatment were granted. This concern has been allayed by inclusion of market disruption provisions in the Agreement.

Basic Provisions

The U.S.-Soviet Agreement provides in Article 3 that each Government may take measures to ensure that the importation of products originating in the other country does not take place in such quantities or under such condtiions as to cause, threaten, or contribute to the disruption of its domestic market. The consultation procedures established for the implementation of this provision represents a Soviet commitment to honor the U.S. request to limit U.S.S.R. exports to the United States.

Under the consultation procedures set forth in Annex I to the Trade Agreement, the United States can request bilateral consultations should actual or prospective imports of a Soviet product cause, threaten, or contribute to disruption of the U.S. market. After such consultations, which must be concluded within 60 days of the U.S. request, the U.S.S.R. has agreed not to ship to the United States products designated by the United States. In an emergency situation U.S. retrictions or other conditions could be imposed prior to the conclusion of U.S.-Soviet consultations. In the event the Soviets should request a limitation of U.S. exports, the U.S. Government is obliged to make such information available to the U.S. business community.

In Soviet trade agreements with other countries this subject is covered by a much more general provision which usually states that prices of goods supplied are to be established on the basis of world market prices.

Expanded Government Commercial Facilities

United States Government commercial services in Moscow have been hampered by inadequate space and facilities available at the U.S. Embassy. The Soviet Commercial Counselor's Office in Washington likewise has sought larger and better-maintained premises. The October 1972 agreement permits (a) expansion of the Commercial Counselor's Offices of the respective Embassies in Moscow and Washington and (b) establishment of a U.S. Commercial Office in Moscow at a location apart from our Embassy, and a U.S.S.R. trade representation in the United States.

Expanded Private Business Facilities

Like all foreign firms, U.S. business firms may not establish a permanent office in Moscow with the power to hire local personnel and the right to receive office space, facilities and housing without accreditation by the Soviet Government.

Accreditation is carefully controlled and rarely granted. It may be extended to foreign firms that are known on the world market and that have operated as trade partners of Foreign Trade Organizations (FTOs) with which they have concluded especially large commercial transactions. Firms so accredited are expected to assist the FTOs in

the development of Soviet exports, including machinery and equipment; in the import of machinery and equipment that is technologically modern; and in familiarization with the newest achievements of world technology.

Until very recently, only two U.S. firms, Pan American and American Express, were accredited. Since trade negotiations were commenced, Pullman Inc., Occidental Petroleum, and Chase Manhattan Bank have been accredited. The Soviets have agreed that they will continue to accredit U.S. firms on a basis no less favorable than that accorded firms of any third country. Any problems arising out of these accreditation procedures will be resolved through the U.S.-U.S.S.R Joint Commercial Commission.

The Soviets have given written assurances that U.S. accredited companies will be authorized to employ Soviet personnel, acquire needed telephones, telex equipment and other such communications facilities promptly; import business equipment, such as typewriters, calculators, dictation and copying equipment, and automobiles and personal items such as furniture and appliances; have access to suitable housing; and receive prompt processing of visa requests.

One major solution to the problem of inadequate business facilities in Moscow is the international trade center which the Soviet Government has promised to construct. Such a permanent center would ease the access of American businessmen to Soviet trade offices and would contain living, working, and display space; telephone and secretarial facilities; and facilities for dependents. This complex will reportedly provide offices for 400 to 500 firms and contain 3,000 to 3,500 hotel rooms.

In the United States, the Soviets have their Intourist office and the Amtorg Trading Corporation offices in the prime business district of midtown Manhattan. Amtorg acts as agent for Soviet Foreign Trade Organizations. In October we agreed to the Soviet request for a Kama Purchasing Office in the United States. Following prompt U.S. Government authorization in December 1972, the Kama River Purchasing Commission opened a large office in February in the GM Building in central New York City to promote equipment orders for U.S. firms.

Arbitration

BACKGROUND

In moving toward normalization of trade relations with a state-trading monopoly such as the Soviet Union, the United States faced the problem that many of the conventional legal and administrative parameters of trade activity were simply not established. Among these was the matter of arbitration.

The Soviets have preferred their own highly reputable arbitration courts. For the last forty years they had a policy of encouraging arbitration under the auspices of the Foreign Trade Arbitration Commission in Moscow which is composed of fifteen Soviet nationals. Arbitration in a third country was agreed to by the Soviet Foreign Trade Organizations only if the Western firm demanded and was able to negotiate a third country provision in the purchase or sale contract. By contrast, the United States has had a long tradition of reliance on

international third party arbitration and specialized mechanisms designed for the settlement of special kinds of disputes. The rules of the American Arbitration Association provide that where a party to an arbitration proceeding is not an American, he has a right to have the controlling arbitrator be from a third country.

Basic Provisions

The Trade Agreement encourages settlement of commercial disputes by arbitration under the Arbitration Rules of the Economic Commission for Europe, a United Nations agency, in a country other than the Soviet Union or the United States, and with arbitrators appointed by an authority in a country other than the Soviet Union or the United States. Parties to contracts, however, are free to decide on any other means of arbitration "which they mutually prefer and agree best suits their particular needs." In addition, U.S. firms are guaranteed the right to use the processes of Soviet courts and comparable Soviet organizations are assured similar access to U.S. courts.

Third country arbitration has been preferred by the majority of U.S. business men who have negotiated agreements with the U.S.S.R. to date. Obtaining such clauses in future agreements should be easier because the U.S.S.R. has publicly recognized and endorsed this type of arbitration as an appropriate dispute settlement mechanism.

Arrangements for Reciprocal Authorization of Government Credit

BACKGROUND

The question of credits is crucial to expanding trade with the Soviet Union. Given the U.S.S.R.'s persistent hard currency shortage and the current levels of Soviet foreign exchange in relation to demand for equipment from abroad, the volume of U.S. exports can be expected to be importantly affected by the amount of U.S. export credit made available.

The United States took the position that satisfactory action on the Lend-Lease debt question was a necessary prerequisite for making export credits available to the Soviet Union. As a part of the general commercial accords reached between the United States and the Soviet Union, such financing is now available. These accords included a separate agreement settling the Lend-Lease debt question.

Unlike the Lend-Lease Agreement, however, the "Agreement on Financing Procedures," signed on October 18, 1972, by the Export-Import Bank of the United States (Eximbank) and the Soviet Foreign Trade Bank (Vneshtorgbank), is not tied to the trade agreement and will remain in effect even if the latter cannot enter into force because of Congressional refusal to extend MFN status to the Soviet Union.

BASIC PROVISIONS

In addition to setting forth general procedures, the operating agreement provides that all credits extended directly from or guaranteed by Eximbank will have Vneshtorgbank as the obligor. Under the terms of the agreement, Eximbank will now supply direct credits to Vneshtorgbank on a case-by-case basis. Supplier credits are not

included in the agreement. The normal financial pattern for a direct credit consists of 10 percent down-payment, 45 percent from Eximbank at 6 percent and 45 percent from a commercial bank at a negotiated rate. The commercial bank may have an Eximbank guarantee for its portion if it so desires.

These Eximbank direct credits and financial guarantees will be extended in connection with export sales to the Soviet Union conducted within the range of common commercial practice. Such Eximbank activities fall under the provisions of the Export-Import Bank Act of 1945, as amended (12 U.S.C., sec. 635), which grant the President of the United States the authority to determine that extension of such Eximbank credits and guarantees is in the national interest.

The Fino Amendment (P.L. 90–267, 82 Stat. 48, 1(c) (3)) passed in 1968, prohibited extension of Eximbank credits and guarantees to a country furnishing, by direct governmental action, goods, supplies, military assistance or advisors to a nation engaged in armed conflict, declared or otherwise, with armed forces of the United States. The Amendment applied to North Vietnam and those countries assisting North Vietnam, including the U.S.S.R. The Export Expansion Finance Act of 1971 (P.L. 92–126, 85 Stat. 345) modified the Fino Amendment by restoring to the President of the United States discretionary authority to permit the extension of export credits and/or guarantees to communist countries where he determined this to be in the national interest. As of October 18, 1972, the President has made such a determination for the U.S.S.R. and, pursuant to the requirements of the legislation, so notified the President of the Senate and the Speaker of the House of Representatives.

Scientific and Technical Cooperation Agreements

The dimensions of the U.S.-Soviet relationship in science and technology expanded greatly during 1972. A 2-year Agreement on Exchanges and Cooperation in Scientific, Technical, Educational, Cultural, and Other Fields, signed in Moscow in April 1972, provided for the continuation and expansion of bilateral exchanges. In May, four other agreements relating to science and technology, described below, were signed during the Moscow Summit.

Science and Technology

An Agreement established a Joint Commission on Science and Technology which in March of 1973 considered proposals for cooperative projects developed by working groups in six areas: energy research and development, application of computers in management, agricultural research, production of substances employing microbiological means, water resources, and research in the field of chemical catalysis. Heading the Commission are the National Science Foundation Director, and the First Deputy Chairman of the State Committee of the U.S.S.R. Council of Ministers for Science and Technology.

Space

This Agreement looks toward the development of cooperation in the fields of space meteorology; study of the natural environment; explora-

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tion of near earth space, the moon and the planets; and space biology and medicine. The first joint docking experiment of the two countries' piloted spacecraft is contemplated for 1975. Joint working groups developed under arrangements between NASA and the Soviet Academy of Sciences are carrying forward planning for cooperative efforts.

Medical Science and Public Health

The initial research efforts of the cooperative program are concentrated on health problems important to the whole world—cancer, heart diseases, and the environmental health sciences. A number of meetings have been held between HEW officials and their Soviet counterparts to develop research plans. The second meeting of the Joint Committee for Health Cooperation, which supervises implementation of cooperative programs under the agreement, met in Washington, D.C. in late March 1973.

Environmental Protection

The first meeting of the Joint Committee was held in Moscow in September to implement this Agreement. A number of specific projects in the eleven subject areas named in the Agreement were agreed upon (air pollution, water pollution, pollution related to agricultural production, enhancement of urban environment, nature and preserves, marine pollution, biological and genetic consequences, influence of environmental changes on climate, earthquake prediction, arctic and subarctic ecological systems, and legal and administrative matters).

IV. Role of the Joint U.S.-U.S.S.R. Commercial Commission and Its Prospects for the Future

At the May 1972 Moscow Summit Conference President Nixon and Soviet leaders agreed to establish the Joint U.S.-U.S.S.R. Commercial Commission as the instrumentality through which the normalization of trade relationships would take place.

Twenty-five years of economic cold war between the two nations and the complex problems inherent in trading between centrally planned and free market economies necessitated the creation of an institutional mechanism which would highlight the trend of detente and allow for a more definitive and responsive interface between the two widely differing types of economies. The commission approach, it was felt, could also serve to facilitate bringing together on short notice the appropriate high-ranking officials from both countries.

Structure of the Joint Commission

The commission consists of a U.S. and a Soviet section, each with its own chairman and executive secretary. The Chairman of the Soviet section is Foreign Trade Minister Patolichev. The Chairman of the U.S. section at future commission meetings will be George P. Shultz, Chairman of the Council on Economic Policy. The U.S. section of the first two commission meetings was chaired by former Secretary of Commerce Peter G. Peterson. The Executive Secretary of the U.S. side is Deputy Assistant Secretary of Commerce Steven Lazarus, Director of

the Bureau of East-West Trade. This bureau has an Office of the Joint Commission Secretariat to provide backup resources for the U.S. section. Commission rules and procedures provide for meetings no less than once a year. Two meetings have taken place. The third session, not yet firmly scheduled, is expected to take place in Moscow sometime in 1973.

Commission's Future Functions

During the first and second sessions, held in July and October of 1972, the U.S.–U.S.S.R. Joint Commission carried out its principal negotiating mandate. At the October session held in Washington, the Commission completed the negotiation of a trade agreement; arrangements for reciprocal authorization of government credits; provisions for the reciprocal establishment of business facilities; a mechanism for settling disputes; and a lend-lease settlement.

Much of the work of the Commission during its first two meetings was accomplished in task force sessions. The four operating task forces were: trade agreement; lend lease; patents, licenses, copyrights, and taxation; and joint economic projects and financing.

On the U.S. side the task force approach has proved effective in bringing together a variety of expertise not readily available in a single-agency effort. It has also facilitated co-ordination of policy development through lines into the U.S. Government agencies furnishing task force members. Through multiple U.S.S.R. representation on the task forces, there was, in like fashion, assurance that the appropriate foreign trade agencies were engaged in the task force effort.

The first two task forces, on the trade agreement and on the lend lease, have completed their assignments but have not been officially dissolved. The trade agreement will not enter into force and the bulk of lend lease payments will not commence until after Congress has authorized extension of most-favored-nation status to the U.S.S.R. The major continuing function of the Commission is to monitor the spectrum of U.S.-U.S.S.R. commercial relations, and study and facilitate possible U.S.-U.S.S.R. joint projects, as well as to oversee the implementation of the trade agreement after its entry into force.

There are a number of monitoring responsibilities of the Commission. Most importantly, the Commission will maintain a continuing dialogue between the two sides on various policy questions and on specific government-to-government issues as well as provide a channel for discussion of the problems of individual firms in order to ensure that U.S. commercial interests are effectively represented. The Commission provides a convenient and unique forum for each government to bring matters of interest and concern to the attention of the other. Additional agreements may also be negotiated as the work of the Commercial Commission progresses. The task force on patents, licenses, copyrights, and taxation made significant progress at the first two Commission meetings. Work is continuing and it is expected that additional progress on these issues will be made at the third Joint Commission meeting to be held in Moscow.

The Commission's mandate to study and facilitate possible joint ventures is being carried out by the two task forces on joint ventures: Joint Economic Projects and Financing, and Gas. Large joint ventures,

particularly in raw materials of which the U.S.S.R. possesses large reserves, such as natural gas and petroleum, may be the most important commercial result of the new relationships. The Commission's special task force on gas, established during the second session of the Commission, will study possible U.S. participation in two mammoth natural gas developments in the U.S.S.R. involving extraction in distant underdeveloped areas, long pipeline transmission, liquefaction, and shipment by sea in complex, highly expensive vessels. Such projects will require enormous capitalization. The importation of Soviet natural gas is also intimately tied up with a general decision on U.S. national energy policy.

The joint economic projects and financing task force is studying somewhat less ambitious, although still sizable, opportunities. The importation of platinum, for example, is a possible candidate for major trade. Interest has also been expressed in Soviet zinc, chrome, bauxite, iron ore, and timber. Still other projects would be possible in manufactured products such as fertilizer, farm implements, and cellulose.

Underlying both task forces is the realization that the development and export of Soviet raw materials and U.S. joint venture participation in Soviet industrial projects can provide the hard currency necessary to bring about substantial two-way trade.

The trade agreement specifically provides that the Soviet Union and the United States will work through the Joint U.S.-U.S.S.R. Commercial Commission "in overseeing and facilitating the implementation of this Agreement in accordance with the terms of reference and rules of procedure of the Commission." In overseeing the implementation of the trade agrement, the Commission members will consult with each other with regard to specific problems encountered in carrying out the terms of the agreement. Problems could arise, for example, in connection with trade agreement provisions for the availability of U.S. business facilities in the U.S.S.R. equivalent to those granted businessmen of other nations. U.S. businesses, as is the case with all foreign firms, may not establish a permanent office in Moscow with the power to hire local personnel and the right to receive office space, facilities and housing without individual accreditation by the Soviet Government. Problems stemming from the accreditation procedures will be resolved through the Commission.

The Commercial Commission will also oversee the effective execution of other provisions of the trade agreement such as those with regard to market disruption and arbitration procedures.

The role of the government with respect to the implementation of the trade agreement is basically one of creating a legal environment in which our private sector is treated fairly and in which the problems are handled in a manner that prevents the escalation of minor commercial matters. In a sense one could say the Joint Commercial Commission was set up to anticipate the special problems that can naturally be expected to arise in the course of trade relations between a private enterprise and a state trading system.

The Bureau of East-West Trade, established to provide direct staff support for the Commission, recently issued a folio on U.S.-Soviet Commercial Agreements in 1972 containing texts, summaries and supporting papers to provide U.S. business firms with background on the agreements. The bureau also plans to circulate to businessmen on a

continuing basis information which will serve to facilitate cooperation between the United States and the Soviet Union on commercial and related economic matters.

Future Life of the Commission

The Joint U.S.-U.S.S.R. Commercial Commission was established to meet a clearly perceived need—to arrange for and facilitate a normalization of trade relations betwen the two countries. That need is viewed as persisting through the foreseeable future as the commercial interfaces between the two different kinds of economies multiply and enlarge.

The effective operation of the Commission will certainly speed the achievement of as full a normalization of trade relations between the two countries as their different economies permit.

EAST-WEST TRADE AND INVESTMENT POLICY ISSUES: PAST AND FUTURE*

By FRANKLYN D. HOLZMAN

CONTENTS

Hardly a year goes by without an investigation by some branch of the United States Government into our East-West trade policies. How much impact these investigations have had on U.S. policies is difficult to say. On the one hand, our official Government policies have changed little. This is evidenced by continued existence of the Johnson Act of 1934, embargoes on China and Cuba, Export Control Act and Battle Act, unwillingness to grant MFN status to most Eastern nations, and so forth. On the other hand, there has been considerable, though gradual, relaxation over the past 20 years at the administrative level as evidenced by less restrictive enforcement of the Export Control and Battle Acts, and the Johnson Act of 1934. This trend is, in my opinion, a sensible adaptation to changing objective conditions; primarily (but not exclusively) the lessening of Cold War tensions; belated recognition of the important fact that the "enemy" is not united and (to use a hackneyed phrase) monolithic; and increasing difficulties in obtaining Western European cooperation in our policies, without which these policies are largely ineffective in achieving their purposes. Even if conditions hadn't changed, serious questions could be raised regarding the conception of our legislation on East-West trade and investment and whether this legislation was properly designed to achieve American objectives.

*The first three sections of this paper were submitted to the President's Commission on International Trade and Investment and originally published (along with 2 sections which are not included here) in *United States International Economic Policy in an Interdependent World. II*, Washington D.C. 1971, pp. 363-395. The final section, which deals with problems of the future, was written specially for this Compendium.

The various Acts mentioned above will be reviewed below for their appropriateness in light of present conditions and for their effectiveness. The time has come, it seems to me, to bring our legislation into harmony with our national interests as well as with the individual interests of our citizens as consumers and businessmen. In the final section of the paper, we consider future East-West trade problems particularly those relating to the currency inconvertibility and balance of payments difficulties of the Soviet Bloc nations.

I. Policy Issues

Direct Physical Controls Over Exports to the U.S.S.R. and Eastern Europe

Since the end of World War II, probably the single greatest deterrent to an enlargement of East-West trade imposed by the West has been in the form of export controls. As time has passed, these controls have been progressively relaxed so that the statements applies with greater force to the early postwar periods. These controls have been embodied primarily in two pieces of Congressional legislation, the Export Control Act of 1949 and the Mutual Defense Assistance Control Act of 1951, better known as the Battle Act.

The Export Control and Battle Acts

The Export Control Act was passed originally as a substitute for various ad hoc measures used right after the War to prevent the export of goods deemed to be important to our national security. The goods listed under the Act as "strategic" presumably were selected because of their possible contributions to the military-industrial potential of recipient nations as well as, at the time (1949), to prevent export of goods which were in short supply in the United States. While the Act applied in theory to exports to all countries, in fact licenses for exports of listed commodities were usually easily obtained when the recipient was from a Western nation, but not often granted when the importing nation was in the Soviet Bloc. In an amendment to the Act in 1962, the basis for including commodities on the proscribed list and denying export license was substantially broadened from what had been primarily a military criterion to one which could encompass almost any commodity desired by another country, Congress found that "unrestricted export of materials without regard to their military and economic significance may adversely affect the national security of the United States" and provided for the denial of a license for the export of any commodity "to any nation or combination of nations threatening the national security of the United States if the President shall determine that such export makes a significant contribution to the military or economic potential of such nation or nations which would prove detrimental to the national security and welfare of the United States." [1] Since no nation is likely to seek trade which does not provide it with military or economic benefits, this amendment gives the President the power to ban the export of any—or all—commodity to the Soviet Bloc if he sees fit. While the spirit of the amendment is drastic,

[1] Both citations taken from: United States Senate, Committee on Banking and Currency, Hearings on *East-West Trade*, 1968, Part 3, pp. 1194–5.

in practice it means little or no change but simply justified, ex post facto, the denial of export licenses in the past for many commodities which had been hard to justify under a "military" criterion.

In the Export Administration Act of 1969, the "economic" criterion was deleted and the only goods proscribed from export were once again those contributing to military potential. Further, as noted above, the trend has been toward progressive relaxation of export controls. In fact, from 1966 to 1968, approximately 450 additional items were removed from the Commodity Control List of "strategic" commodities administered by the Department of Commerce; this still left, however, some 1,800 commodities which require a validated license for export to the U.S.S.R. and East Europe.[2]

The Battle Act, passed under the influence of the Korean War, essentially was an attempt by the United States to enlist the cooperation of the NATO nations and Japan in achieving the goals of our Export Control Act. Lists (called Cocom lists) of "war materials" and "other materials" which should not be exported to "nations threatening the security of the United States, including the U.S.S.R. and the countries under its domination" [3] are drawn up under mutual agreement. In the event that one of the NATO nations or Japan knowingly allows the shipment of a proscribed item to the Communist Bloc, the Act provides that the United States terminate all military, economic, and financial aid to that nation. The President is empowered, however, to direct continuance of aid if it is in the interests of U.S. security. At the time the Act was passed, the potential penalty was severe since Europe was receiving Marshall Plan aid. Penalties were rarely, if ever, applied in the 1950's, however, despite the fact that the Act was frequently breached. In the past decade, the flow of aid to Western Europe has been so slight (or non-existent to many nations) that the penalty provision has become inoperative vis-á-vis most of these nations.[4]

A Digression of Economic Warfare

These are the basic provisions of the two Acts. They were basically conceived as temporary extensions of wartime measures. As such, there may have been some justification for their continuation until, say, the mid-1950's. Their continuation after that time is, in my opinion, completely misguided and has resulted in more harm than good to the interests of this nation. By the mid-fifties, the two Acts should have been allowed to lapse except for the maintenance of controls over the export of classified military goods and perhaps a few commodities embodying very advanced military-industrial technology in which the United States has a monopoly.

I have said that our export control policy may have been justified before the mid-fifties. I think it is worth pointing out, however, that it was highly optimistic to believe that it could have had, even at that time, a significant effect on the military capabilities of the Soviet Bloc. The most dramatic evidence that our embargo policy was not likely to have much effect was contained in the experts' assessments of the impact of our World War II embargo and strategic bombing efforts vis-

[2] Leon Herman, "East-West Trade: An Overview of Legislation, Policy Trends, and Issues Involved," Legislative Reference Service, Library of Congress. June 17, 1968.
[3] Cited by Herman, p. 5.
[4] Control over exports is by no means confined to the two Acts under discussion in this section. Controls are also exercised through the *Trading with the Enemy Act of 1917, Agricultural Act of 1961,* and others.

á-vis Germany, which were carried out with infinitely greater intensity than our present policies directed at the Soviet Bloc. I quote one of many similar judgments based on the evidence:

"During World War II the Allied bombing of Germany was based on the so-called 'bottleneck theory'. It was thought that the military-supporting base would collapse if industries producing certain strategic components, such as anti-friction bearings, were destroyed. The futility of that denial was demonstrated in surveys carried out after the war. They showed that even under blockaded wartime conditions, substitutes for materials denied or destroyed were rapidly developed and factories were quickly reconstructed by transfers of machinery from other less essential industries. It was concluded that denials, whether by bombing or embargoes, to be really effective must be very broadly based on near-complete." [5]

Another piece of evidence that weighs heavily against the possible success of an embargo policy is that provided by Soviet foreign trade behavior in the 1930's.[6] The first two Five Year Plans (1928–1937) placed very heavy dependence on imports of machinery, equipment, and other such commodities scarce to a nation just launching a forced industrialization program. The commercial conditions under which the U.S.S.R. was forced to trade, partly because of western hostility but also because of the great depression, were so adverse that, despite well-laid plans, it practically withdrew from foreign trade. By 1937, imports had declined to 30 percent of the 1931 level and had fallen from more than 3 percent of GNP to about ½ of one percent of GNP. What this little bit of history points up is that the U.S.S.R. (and today the Soviet Bloc), like the United States, imports from choice, not necessity. At present, in peacetime, even a very tight embargo may be a cause of passing inconvenience and delay, and perhaps a small cost—but no more than that. Small costs like these are especially easy for a centrally planned economy to bear. This is because, for the most part, their economies are growing rapidly; and because it is easier for them to shift such costs to the consumer sector. Look how difficult (so far impossible) it is even in a democracy like the United States to remove resources from the inflated military machine into the battle for less pollution, less poverty, more medical care, better cities, and so forth!

A final point to be made regarding the optimism of our efforts to hurt the Soviet Bloc militarily, and this point is more relevant now than it was before 1955, is the relative divorce of military power from industrial power. With the advent of nuclear weapons and of rockets to deliver them, preparation for war and the fighting of war no longer involve total economic and industrial commitment as it had in the past. A policy there, designed to do anything more than deny the enemy crucial military know-how or materials, is misguided.[7]

Having presented evidence that our policies were "optimistic" as implemented in the early postwar period when the Cold War was intense, indeed, and some possibility of open hostilities may have existed, let me now turn to two fundamental misconceptions behind these policies as implemented over the past 15 to 20 years. In discussing these misconceptions, it is assumed that an embargo policy might succeed in its objectives, an assumption which I have already attempted to show has little basis in reality.

[5] Wilczynski, *The Economics and Politics of East-West Trade*, New York, 1969, p. 286.
[6] Cf. this writer's "Foreign Trade" in A. Bergson and S. Kuznets (eds.) *Economic Trends in the Soviet Union*, Cambridge, 1963.
[7] This must be qualified for "limited wars"; but "limited wars" were not the target of the Acts under review.

The first misconception amounts to a confusion between the short-run and the long-run. If the short-run probability of war is high, proper strategy dictates a policy similar to that followed by the United States: deny the potential enemy strategic commodities. If, on the other hand, the probabilities of war are low in the short-run, as they have been over the past 15 years, then a different strategy is called for. The better long-run strategy against a potential enemy is to make him as dependent upon you as possible. For the more the opponent is dependent upon you, the more vulnerable he is to damage from economic warfare at the time when it really counts. It is well-known, for example, that the rapid development of Polish and Russian aluminum capacity owes a debt to our postwar embargo policy. Furthermore, that necessity is the mother of invention is evident here also. It has been pointed out[8] that (1) the embargo of natural rubber to the U.S.S.R. led to technological developments by that nation in the production of synthetic rubber and to the growth of a large synthetic rubber industry; (2) the embargo of industrial diamonds was responsible for both a research effort in which an electric arcing device was developed and used as a substitute for the diamonds in some uses, and for an intensive prospecting effort which culminated in the discovery of vast diamond ore reserves in Eastern Siberia. Many other examples could be cited. It seems clear that our policy of the last 15 years, rather than weakening the Soviet Bloc, has undoubtedly put it in a better position to fight a war today should a war suddenly break out.

The second major misconception behind our policies is the idea that an embargo should concentrate on military or so-called strategic commodities as opposed to non-military non-strategic goods.[9] Once it is agreed that war is not imminent, two strategies appear possible. The first, just discussed, is to trade freely (with minor exceptions) with the potential enemy in the hopes of making him as dependent as possible on you. If this policy is rejected, then the appropriate economic warfare strategy would seem to be to concentrate the embargo on commodities where the gains from trade to the enemy are likely to be very large.[10] That economic as well as military gain should be a criterion of embargo policy seems to have been recognized in the 1962 amendment to the Export Control Act cited above. However, implementation has been deficient. Defense-related items still predominate on the lists of controlled exports. Further, those who have been administering the control lists do not seem fully aware of the fact that the gains to the enemy from imports are not necessarily larger when the commodities in question are products of defense-related industries. A better assumption in the case of the U.S.S.R. is that the gains from imports are larger the further removed the products are from the defense area. This has been clear to specialists for a long time from information of diverse sorts about the Soviet economy. Fifteen years ago it was generally thought among Sovietologists that if the U.S. and the U.S.S.R. were to trade freely with each other on the basis of comparative advantage, the U.S.S.R. would import agricultural products and consumers' goods from the U.S. and the U.S. would import industrial

[8] Committee on Foreign Relations, U.S. Senate, *East-West Trade*, Nov. 1964, p. 215.

[9] It is interesting to note that the U.S.S.R. allows us to import on a regular basis, a sizeable list of strategic commodities despite the Vietnam War; platinum, iridium, palladium, rhodium, nickel, magnesium, titanium, cadmium, chrome ore, molybdenum, and aluminum scrap (cf. Herman, p. 19).

[10] Losses from denying trade to the opponent would have to be balanced, of course, against the losses to the nation imposing the embargo. This point never seems to weigh in U.S. calculations. See below.

products from the U.S.S.R. These "informed guesses" were substantiated by a series of unclassified studies of product-by-product dollar-ruble ratios carried out by RAND Corporation and the Central Intelligence Agency. These studies clearly demonstrated that the ruble was worth relatively more in the industrial sector relative to the dollar than in the agricultural and light industry sectors. Early this year, attention was called to these studies, particularly to that of Abraham Becker of RAND published in 1959, by Michael Boretsky in his Joint Economic Committee study "The Technological Base of Soviet Military Power." [11] The following are selected dollar-ruble ratios for 1955 as calculated by Becker, Boretsky, and the C.I.A.:

	1955 Dollar-Ruble ratios
Electrical control apparatus	9.09
Power boilers and steam turbines	8.33
Metal-cutting machine tools	5.56
Electro-technical products, excl. control instruments and electronic equipment	3.52
Railroad equipment	2.70
Farm machinery and tractors	1.54
Motor vehicles	1.23
Food and non-food consumers' goods	[1] 1.00

[1] In a C.I.A. study, the ruble was shown to be worth approximately $0.63 in food and $0.56 in non-food consumers goods. For comparability, the turnover tax should be removed and this would bring these ratios up to about $1.00. Cf. C.I.A. A Comparison in the U.S.S.R. and the U.S., Jan. 1964.

What these ratios say is that a ruble was worth $9.09 in the production and purchase of electrical control apparatus but only $1.54 in farm machinery and tractors, $1.23 in motor vehicles, and somewhere around $1.00 in consumer goods. Why should this be so? Boretsky theorizes (p. 203) that "... the decisive factor is the relative priority for investment, research funds and other resources which a particular Soviet product line has enjoyed in *Gosplan* and/or the party over the years..." Since defense-related industries receive priority in investment and research effort whereas consumer-oriented industries and agriculture do not, the latter tend to be relatively inefficient and high cost, the former relatively efficient and low cost. An embargo policy designed to prevent the U.S.S.R. from reaping large gains from trade would do well to concentrate on low dollar-ruble ratio commodities.

For those who are still not convinced, let me quote a statement by Thomas Schelling of Harvard University before the Senate Committee on Foreign Relations in 1964:

"Wheat shipments may have the same effect on military programs as jet engine sales. Wheat shipments may permit the Soviets to keep chemical industries oriented toward munitions rather than fertilizers; jet engine sales may permit the Soviets to allocate engineering resources to consumer goods rather than jet engines." [12] What Schelling doesn't say is that the relative gain to the Russians in this resource reallocation process is much greater in the case of grain imports than jet engine imports because they are relatively more efficient in production of the latter.

Before turning to the case of commodities such as computers which embody very high technology and know-how, let me first point out

[11] Michael Boretsky, "The Technological Base of Soviet Military Power", in Joint Economic Committee, Congress of the United States, *Economic Performance and the Military Burden in the Soviet Union*, Washington, D.C. 1970, pp. 189–231.

[12] In *East-West Trade*, op cit., p. 290.

briefly a number of other deficiencies in the conception of the Export Control and Battle Acts. First, as already footnoted above, there is a tendency in establishing control lists to ignore the fact that trade benefits not just the importer, but the exporter as well. The gains from exporting accrue (1) to the exporter in the form of profits, (2) to the exporting nation in the form of foreign exchange reserves, (3) or if the reserves are spent on imports to the importing enterprise in the form of profits, and (4) to the ultimate user of imports in the form of cheaper or better products. In this connection, it is important to note that the gains from trade which are sacrificed by the United States as a result of the Export Control Act are of relatively much less consequence to this country than are the gains foregone by Western Europe in the implementation of the Battle Act. This is because exports and imports amount, on the average, to perhaps 20 or 25 percent of the GNP's of the nations of Western Europe in comparison with the 4 or 5 percent of U.S. GNP.[13] It may well be that implementation of the Battle Act hurts our allies as much or almost as much as the smaller nations of Eastern Europe and more than it hurts the Soviet Union.

Second, for at least a decade it has been stressed over and over by critics of our East-West trade policies that the communist nations are not a monolithic group but encompass considerable political diversity. Further, it is clear that each nation puts its own national interest above that of the group, an important factor in the failure of the Comecon nations to "integrate" their economies to any significant degree. While some cognizance has been taken of this situation, we certainly have not in our trade policies exploited it as fully as we might have.

Third, to a considerable extent our control lists are ineffectual in preventing the sale of embargoed commodities. This is because (1) the list observed by the United States is longer than that observed by Western Europe, and (2) implementation of Western European controls appears to be considerably less stringent than implementation of U.S. controls. In either case, commodities which this Nation feels should not be shipped to communist countries nevertheless find their way eastward. This is deplorable on two counts. First, it needlessly deprives American enterprise of markets. Second, it creates an image of impotency and ineffectualness.

High-Technology Commodities

So far the discussion has centered on commodities in general. Consider now the policy toward the export of goods, whether military[14] or civilian, which embody advanced technology. Computers are probably a classic case of a high-technology commodity which has both civilian and military uses, and in which the U.S. has the technological lead. The case against exporting computers, advanced weaponry, and the like to the Eastern Bloc is probably made more cogently than for any other group of commodities. Recent developments are taken by some scholars to suggest that the Soviet Bloc may be particularly vulnerable at this time to export controls over commodities embody-

[13] Comparable figures for the smaller countries of Eastern Europe and the U.S.S.R., respectively, explain Eastern Europe's greater interest in East-West trade than is true of the Soviet Union. It is also worth pointing out that the Soviet Union's very small ratios of exports and imports to GNP, of around 3 percent each, suggest the futility of trying to seriously hurt their economic or military efforts via economic warfare.

[14] It seems highly dubious that the U.S.S.R. would want to buy weapons from us which did not embody advanced technology; they are probably as efficient at producing them and as overstocked as we are.

ing advanced technology. The developments I am referring to are the retardation in growth rates experienced by all of the European communist nations. Further, analysis of the causes of the slowdown in the Soviet growth rate by both Soviet and Western economists suggests that a decline in the contributions of technological progress may have been primarily responsible.[15] Those who believe in economic warfare therefore find the present situation an ideal one for employment of export controls.

In my opinion, the case for controls is not so irresistible. With the exception perhaps of the most highly strategic commodities embodying new technology, the case for export controls here is subject to most of the criticisms presented above. For example, it remains true that many products, the export of which we would like to ban, will be available from Western Europe. Further, even if the Bloc nations cannot import prototypes, they can derive considerable information from the technical journals which are freely available. According to an authoritative study, Soviet computer experts are fully abreast of developments in this field through the literature even though the Soviet computer industry lags way behind.[16] Also, in the area of technology, the possibility of differentiating our control policies to favor some communist nations but not others is virtually negligible because of the present relatively free dissemination of "know-how" in the Bloc and the fact that dissemination is almost costless. It also remains true that while there may be short-run losses from not being able to import technology, there may be long-run gains and development of greater independence. This point was put another way by the so-called Miller Committee [17] which concluded: "In today's world no country can continue to rely heavily on the . . . importation of technology to improve its relative industrial position. To do so may appear to be cheap in the short run, but could turn out to be a sure way of perpetuating second-class industrial status." The fact is that by the time a prototype is exploited by an importer, it is out of date; reliance on importation of technology leads to a systematic lag in technology.[18]

One may also question the interpretation to be placed upon studies cited above which show a declining role for technology in the growth performance of the U.S.S.R. Several recent studies [19] suggest that the problem with technology arises not so much from lack of know-how, although this may contribute, but rather from problems of organization.[20] That problems of economic organization in the centrally planned economies are serious is well-known. Further, they are largely responsible for the recent attempts at reform. Difficulties in the development and introduction of new technology into industry appears to be one of the major consequences of the organizational crisis. The Soviet computer industry is one such victim of organization dysfunc-

[15] Alfred Zauberman, "Pushing the Technological Frontier Through Trade," in *East-West Trade and the Technology Gap*, ed. by S. Wasowski, New York, 1970, 139–147.

[16] Richard Judy, "The Case of Computer Technology," in Wasowski, *op cit.*, pp. 43–72.

[17] Report to the President of the Special Committee on U.S. Trade Relations with East European Countries and the Soviet Union, Dept. of State, 1965, pp. 14–15.

[18] Cf. Leon Herman, "Economic Content of Soviet Trade with the West," in P. Uren (ed.), *East-West Trade*, Toronto, 1966, p. 34.

[19] See articles by Judy, Woroniak, and Wasowski in Wasowski (ed.), *op. cit.*

[20] Let me add a skeptical note on quantitative measurements of the contributions of technology to growth. Technology itself cannot be measured, of course. It must either be approximated by proxy variables of dubious validity (consider that there are even serious problems in getting good measures of changes in labor and capital inputs) or be viewed as part of the residual"—that part of the growth in output not explained by identifiable inputs. As part of the residual, it shares the honors with other unmeasurable inputs like "organization"—certainly a factor of significance in the CPE's today.

tion, according to Judy. The lag behind the West, he argues, is not due to lack of information or lack of competent personnel but rather to the poor incentive-motivational system which discourages risk-taking and encourages the production as well as use of obsolete equipment.[21] What is true of the computer industry is true to a greater or lesser degree of most of the industries in Eastern Europe and the U.S.S.R.

There would seem then to be no special economic reason why commodities embodying advanced technology should be treated differently from other commodities. The failure, if any, of technology to contribute to the growth of the communist nations does not appear to be due primarily to an inability to import, and continued restrictions along these lines are unlikely to have a significant economic effect. There may, of course, be military reasons why products like our most advanced computers should not be exported to the U.S.S.R. Judgments on matters of this sort are beyond the competence of the economist. My hunch is, however, that those who make judgments on these matters usually err several orders of magnitude on the conservative side.

If technology is to be treated like any other commodity, then it should also be paid for like any other commodity and properly protected according to Western conventions. That this has not always been the case in the past is well-known. The reasons are that under communist convention, inventions and technology are in the realm of public goods; further, as large-scale net borrowers, no motivation to adopt Western conventions has existed. This situation is changing. As their technology has caught up, they have technology to sell. Even the Soviet Union finally joined the Paris Convention for the Protection of Industrial Property in 1965. Within the Soviet Bloc, there are pressures to end the free distribution of know-how and put technological exchange on a commercial basis. American firms which want to export technology should bargain for proper price (as they probably do) and secure appropriate guarantees. There is no reason for them to settle for less—and under present changing conditions, they probably will not have to.

The Total Embargoes on China and Cuba

In 1950, the U.S. applied a total embargo on trade with Mainland China under the Trading with the Enemy Act of 1917 because of China's participation in the Korean War.[22] With minor exceptions, a similar embargo was placed on trade with Cuba in 1961. Neither of these embargoes has ever been relaxed to a significant degree by the United States. In 1952, the NATO powers and Japan agreed, as a result of U.S. pressure, to apply more severe controls over exports to China than were in operation against the European communist nations. Our allies were unwilling to maintain this so-called "China differential" and it was abolished in 1957 leaving China on the same footing as other communist nations. The Cuban embargo is participated in by the other nations of Latin America.

At the time the embargo on China was applied, there was, under the circumstances, almost no alternative open to the United States. The

[21] He also argues that the Soviet authorities have not accorded the industry high priority in terms of personnel and investment, suggesting that if they did so their lag could be substantially cut.

[22] North Korea was similarly embargoed at that time and North Vietnam is also presently subject to total embargo.

embargo at that time may even have had an economic and military impact on China and North Korea since, so soon after World War II, the nations of Western Europe were not able, and after 1952 willing, to supply China with commodities denied to them by the United States. Over the past decade, however, the economic and military effects of our embargo must be judged to be close to zero. Certainly, China can get most of the things she needs and probably at not much greater cost, from the U.S.S.R. or Eastern Europe, if not from Japan and Western Europe. Furthermore, like the U.S.S.R. and the U.S., China is a big country with a small trade participation ratio (exports and imports each no more than 3–4% of GNP), and therefore with a naturally limited vulnerability to the effects of economic warfare. The really bizarre feature of this affair is that some 17 years after hostilities with North Korea have ceased, the embargo is maintained with virtual wartime completeness. (This is, of course, no more bizarre than our refusal to recognize China and vote for admission into the U.N.—in fact, it is an economic corollary of these policies.) Continuation of the wartime embargo appears even more bizarre when one considers China's relatively unaggressive military behavior since Korea and her serious political split with the U.S.S.R. In fact, there would seem to be absolutely no reason not to immediately reduce controls over exports to China to the level presently enjoyed by the U.S.S.R. and Eastern Europe.[23]

While China was never very vulnerable to embargo, Cuba was. A small country, Cuba's trade participation ratio is high, in the neighborhood of 30 percent; and Cuba depended heavily upon the United States as a market for sugar and other products and for supplies of machinery and equipment. The embargo certainly hurt Cuba: she lost her sugar market and the source of supply of spare parts to keep her machinery and equipment running smoothly. The Soviet Union was forced to step in and bear a large part of the costs of adjustment. According to Dean Rusk in 1964,[24] the purposes of the embargo were fourfold: to reduce Castro's will and capacity to export subversion to Latin America, to disenchant the Cubans with Castro, to show other Latin American nations that Communism has no future in the Western Hemisphere, and to raise the cost of Cuba to the U.S.S.R. With the exception of the fourth purpose, the embargo would seem to bear little relation to the achievement of these goals.[25] And to a nation willing to spend 10 percent of its GNP on defense, the fraction of one percent required of the U.S.S.R. to assist Cuba must appear to be a small price to pay for a base in the Western Hemisphere. This is not to deny that the Soviet Union undoubtedly makes her contribution to Cuba with reluctance and would like to devote these resources to other ends. Given Soviet priorities, the Soviet consumer undoubtedly is fractionally (of one percent) poorer for the Cuban affair.

Our embargo strategy does not appear to have had its desired effect in Cuba.[26] In retrospect, there is cause to wonder whether Cuba would

[23] Lest someone should contend that by our embargo we might have influenced China's behavior, recall that China broke with the Soviet Union on political and ideological matters, although at the time this meant disrupting economic relations with the nation which took half of her foreign trade and from whom she had received long-term credits.

[24] Cited by Wilczynski, pp. 376–377.

[25] Witness the recent coup in Peru and the Allende victory in Chile.

[26] Not only was the embargo vitiated by an increase in Soviet Bloc trade and aid, but the nations of Western Europe continued to trade with Cuba despite the imposition of sanctions by the United States. Cf. Gunnar Adler-Karlsson, *Western Economic Warfare, 1947–1967*, Uppsala 1968, Chap. 17.

not have become another Yugoslavia had the United States treated her revolution with sympathy or even with neutrality rather than with an act of total economic warfare. Had we not severed trade relationships, Castro would have had to think twice before allowing Soviet missile emplacements in Cuba. The threat, at that time, of severed trade relationships with the United States would have constituted a substantial deterrent. Our embargo no longer has deterrent power. In my opinion there is no percentage in treating Cuba differently from other communist nations.

Extension of Medium- and Long-term Credits to the U.S.S.R. and Eastern Europe

Control of credits extended by private businesses or banks to communist nations lodges in the Johnson Debt Default Act of 1934. This Act prohibited the extension of credits or of financial assistance in any form to any foreign government which is in default on its obligations to the United States. It has since been modified to exclude all nations which are members of the IMF or IBRD. Further, in 1963, in connection with the proposed sale of wheat to the U.S.S.R., the Justice Department stated that the Act was not intended to rule out the granting of ordinary commercial credit by exporters—presumably 90-day credits.

With the exceptions of Albania and Bulgaria, all of the European communist nations are considered to be in default under the Johnson Act. The major items of default, in most instances, are on World War I debts and on Lend-Lease. The Soviet Union's World War I indebtedness is now considered to be in the neighborhood of $700 million, of which $192.6 million is principal and the remainder accrued interest. The major unsettled item in connection with Lend-Lease refers to deliveries made before V-J Day. Negotiations on the roughly $11 billions worth of wartime shipments bogged down in the early postwar period with the United States asking for an $800 million settlement on the estimated $2.6 billion worth of civilian-type supplies in Soviet custody at the end of hostilities and the U.S.S.R. offering $300 million.

It is difficult for an economist qua economist to discuss the Johnson Act soberly: its major (and only) purpose at present would appear to be the political one of denying the communist nations medium- and long-term non-governmental credits. Consider that some 20 nations still owe the United States more than $23 billion in World War I debts[27] (of which roughly half is accrued interest) and that only the Soviet Bloc nations with less than $1 billion of this debt are denied credit; consider also that the nations of Western Europe and Yugoslavia are exempt from the Johnson Act by virtue of having become members of the Bretton Woods organizations, a fact quite unrelated to their debt defaults and to the original concept of the Johnson Act; consider finally that the World War I debt for which the U.S.S.R. is held responsible was incurred by a hostile government subsequently overthrown by the present government, after which the present government was blockaded by the allies; and that the debts were for a

[27] Margaret Myers, *A Financial History of the United States*, New York 1970 p. 407.

war which the Bolshevik leaders did not believe was in Russia's interest and which they denounced.[28]

It is now 52 years since World War I ended. Many of the nations which owe us money no longer exist. To the extent that there is validity to the concept of "statute of limitations," it would seem to apply to World War I debts. We should wipe the slate clean of these "bad debts." Some day they will have to be forgiven or written off, for they will never be repaid. Or is it possible that in the year 2071 we shall still claim that some 20 nations owe us (with constantly accruing interest) more than $100 billion?

The case against Lend-Lease is somewhat different. The present government of the U.S.S.R. can be held responsible for Lend-Lease. Further, payment has been within their means and the requested settlement is in fact only a fraction of the original value of the equipment delivered. Nevertheless, Soviet reluctance to pay is not difficult to understand. For while they profited enormously from the lend-lease shipments, by any measure which can be constructed, they incurred greater losses and underwent more suffering during World War II than any other allied nation. Their losses include about 25 million lives, the destruction of most of their major cities, and much of their industrial capital.[29]

On the other side of the picture, Lend-Lease to the U.S.S.R. certainly saved large numbers of American and Allied lives and resources. In fact, ignoring repayment, Lend-Lease to the U.S.S.R. was probably the single most profitable investment made by this nation in World War II with the possible exception of the atom bomb. Furthermore—and this applies to the World War I debt also—to ask repayment is in basic conflict with international economic mores as they have evolved in the postwar period. Now, even in peacetime, large grants are made to other nations to assist them to develop and reconstruct. If World War II were to be fought all over again, resources would be shared, not loaned. In fact, a hint of misgivings over the fact that any repayment might be expected is contained in President Roosevelt's Letter of Transmittal to the *Eleventh Report to Congress on Lend-Lease Operations* for the period ending July 31, 1943:

"The United Nations are growing stronger because each of them is contributing to the common struggle in full measure—whether in men, in weapons, or in materials. Each is contributing in accordance with its ability and its resources. Everything that all of us have is dedicated to victory over the Axis powers. The Congress in passing and extending the Lend-Lease Act made it plain that the United States wants no new war debts to jeopardize the coming peace. Victory and a secure peace are the only coin in which we can be repaid. . . ."

Like the World War I debt, the Lend-Lease debt would seem to be a purely "political" and in my opinion somewhat hypocritical basis upon which to deny non-governmental credits to the U.S.S.R. under the *Johnson Act*. Also, like the World War I debt, the Lend-Lease debt is an anachronism. If recommendations regarding a Lend-Lease settlement were in order, my own would be the following. A recommendation based on purely moral considerations would hardly fail to

[28] It is perhaps worth noting that the credit-worthiness of the U.S.S.R. has been unquestioned in its post-World War II dealings.

[29] In 1924, Louis Marin expressed similar views in the French Chamber of Deputies: "While war still raged, statesmen in every country appealed to the common cause. Some gave their ships, some munitions, some the lives of their sons, some money, and today only those who gave money come saying to us: 'Give back what we loaned' ". Herbert Feis, *The Diplomacy of the Dollar*, New York 1966, p. 22.

involve, it seems to me, outright cancellation of the debt. Such a step would be based entirely on the situation during World War II under which the debt was incurred and would not imply approval of Soviet policies and actions since that time. Since moral considerations of this purity are not likely to gain many adherents,[30] however, I would offer a second, more pragmatic course of action. It is unlikely that the U.S.S.R. will improve on their offer of $240 million. Since under the Lend-Lease Agreement, all debts are interest-free, it behooves us to accept this offer without undue delay. By accepting the offer, we stand to gain $240 million which might otherwise never be collected. Acceptance of this offer could, of course, be used as part of a package deal in which concessions are made by the U.S.S.R. on some other policy issue.[31]

The major economic consequence of invoking the *Johnson Act* with regard to non-governmental credits is to place our businessmen at a disadvantage in Soviet Bloc markets. It is noteworthy that the Western European nations apply no such restrictions to their own nationals. It is well-worth devoting a few lines to Western European credit policies. Since 1963, in particular, Western European and Japanese attitudes on this matter have been particularly liberal. Before 1963, credits were usually for less than 5 years in accordance with Berne Union rules and interest rates were higher than charged non-bloc customers. Since 1963, longterm credits of 10 to 15 years have commonly been granted on large contracts such as those calling for the construction of large (e.g. chemical and fertilizer) plants and interest rates have fallen in many instances to the 4–6 percent range. These credits have usually been guaranteed by governments or by government corporations; direct government loans have also been extended by a number of nations.[32] Even more dramatic than the extension of credits and loans on favorable terms have been the large number of business ventures which, over the past 7 or 8 years, have been undertaken jointly by private corporations in Western Europe and nationalized enterprises in Eastern Europe, particularly Bulgaria, Hungary, Czechoslovakia, and Poland. Some of these undertakings are located in the West, others in the East. With the exception of Yugoslavia, western firms do not have an equity in joint ventures located in the East but do, of course, share in the profits. These ventures have assumed many forms from joint production to joint marketing activities. A major impetus to Western enterprises has been the lower cost and availability of labor in the East plus entrance to protected markets; the socialist nations are interested in the technological, organizational and marketing knowhow which is made available as well as the import of capital which is involved in most agreements.[33] Joint ventures have not been concluded with the U.S.S.R. although western firms have contracted to construct plants within that nation's borders.[34]

[30] Such a proposal faces the additional problem that Lend-Lease settlements were collected from other allied nations.

[31] The U.S.S.R. is not likely to be willing to make concessions at this point to get a $240 million as opposed to an $800 million settlement since they are probably satisfied with the *status quo* in which settlement remains in abeyance. However, if at some future date another issue is on the table, a $240 million settlement might be used by the United States for bargaining purposes.

[32] Cf. for example, Wilczynski, chap. 10.

[33] Wilczynski, chap. 15.

[34] An outstanding case in point is the Fiat Auto plant. In contrast, our Government advised the Ford Motor Company in 1970 not to enter negotiations for a similar undertaking.

So, to sum up: U.S. policy on credits to and direct investments in Eastern Europe, like our export control policy, suffers the serious defects of being ineffective in achieving its goal as well as in delivering potential markets to others.[35] However, aside from the ineffectiveness of our policy, a question remains as to whether an absolute denial of credit to communist nations makes good economic sense on any grounds. This question is discussed directly below and can be taken to apply to governmental as well as non-governmental credits.

The question of credits to the U.S.S.R. and to Eastern Europe is usually discussed in terms which are not very satisfactory ones to the economist. The question is usually posed in "yes or no" terms rather than in terms of: how much? for how long a period? and at what interest rate? Further, extension of long-term credits, as opposed to commodity trade, is often mistakenly viewed as a form of aid. To quote Dean Rusk:

"While short-term credits are a normal facility in connection with international trade transactions, long-term credits raise different problems. They amount to an extended advance of resources to the purchasing country and, in that sense, they have some of the characteristics of foreign aid." [36]

Let me deal with this latter issue by means of a simple hypothetical numerical example. Suppose a nation borrows $1 million at 4 percent interest which is to be fully repaid in 10 years in a single payment which will amount to $1,480,000. Suppose that the $1 million is invested instantaneously and that the marginal productivity of capital in the borrowing nation is 6 percent. In this case, at the end of 10 years, the borrower will have accumulated an additional $791,000. After repayment, the borrower will have a profit on the transaction of $311,000 over the 10-year period. If the rate of return on capital were 8 percent, the 10-year gain would have been $678,000.

For purposes of comparison, suppose now that a nation is able to export abroad at a 5 percent higher price than at home, and import at a price which is 5 percent below the cost of producing an import substitute. This amounts to a 10 percent profit on balanced trade. Balanced trade in one year of $10 million would generate savings, then, of $1 million which could be invested as above but without the necessity of repayment. The gains over 10 years from this investment would amount to $1,629,000 at a 5 percent marginal productivity of capital; $1,791,000 at 6 percent; and $2,158,000 at 8 percent.[37] Or to put it another way, under our assumption, balanced trade of $1,734,000 in one year would provide as large benefits over a 10-year period as would a $1 million loan which has to be repaid in 10 years when the marginal productivity of capital is 6 percent; balanced trade of $3,139,000 is required if the marginal productivity is 8 percent.

What do these figures tell us? The first lesson is that the gains to a borrower from a loan are not necessarily different from trading commodities with him at prices which yield a profit. As a first approximation, it could then be argued that if we are prepared to engage in peace-

[35] This statement and the analysis of this section applies not only to Johnson Act restrictions but also to the 1968 Fino Amendment to the Export-Import Bank Act. This Amendment prohibits the Bank from providing export credit facilities for trade with nations which are aiding North Vietnam while hostilities with that nation continue. All the Eastern European nations, excluding Yugoslavia, and the U.S.S.R. fall under this prohibition.

[36] Committee on Foreign Relations, U.S. Senate, Hearings on *East-West Trade*, Part I, Washington, D.C. 1964, p. 15.

[37] If the marginal profit on balanced trade were 10 percent, investment would be directed into exports, of course.

ful trade with a nation, it is inconsistent to not also be willing to extend loans.

In rebuttal, it will be argued that a loan enables the borrower to invest more in the current period than would otherwise be possible. This may well be true, particularly given the "over-full employment" which characterizes the Centrally Planned Economies (CPE's) (although usually more savings can be made available, when necessary, by squeezing the consumer a little harder.[38] Granting that it is true, it is nevertheless misleading. First, at the end of the 10-year period the borrower has to repay principal and interest to lender, a transaction typically viewed as a hardship by borrowers. At that point in time, there is a net transfer of resources available for investment from borrower to lender. Secondly, not only are the resources for investment made available at that time to the lender, but unless the lender has been extending credit at a rate of interest which is below the marginal productivity of capital at home, then the lender as well as the borrower is richer than would have been the case had the transaction not taken place.[39]

To sum up: given a time horizon which encompasses a longer period than the immediate present—and except in times of acute international crisis one would expect that our national policies would be framed with such a perspective in mind—then there would not appear, in principle, to be much economic difference between trade with and the extension of credit to another nation. Instead of applying absolute prohibitions on the extension of credits, we should be concerned rather with specifying terms under which the gains from the transaction are properly shared and the risks not undue. So, for example, an intergovernmental $10 billion—4 percent-20 year loan to the U.S.S.R.—would probably be viewed as risky (in terms of repayment), unprofitable, and with potentialities for changing the balance of power. On the other hand, a $500 million—8 percent-6 year loan might well be viewed as contributing to our national interest. As far as extension of credit to the Soviet Bloc by private business is concerned, it is hardly likely to be on sufficient scale to matter one way or another. I would favor repealing the Johnson Act and the Fino Amendment to the Export-Import Bank Act thereby harmonizing our credit and investment policies toward the Soviet Bloc with those of Western Europe.

Restrictions on Imports From Communist Nations: The MFN Problem

A major purpose of GATT and the use of MFN clauses is to foster non-discrimination in trade and to encourage a lowering of trade barriers [40] and an increase in trade on the basis of reciprocal advantage. The Soviet Bloc nations have been very desirous of being accorded MFN status since, without it, they must sell their products in western markets at a disadvantage—subject to higher tariffs (and other impediments) than the exports of other nations. The difficulty which arises in admitting these nations to the MFN community is that they

[38] Poland in December, 1970 constituted an important exception to this statement.

[39] In further rebuttal it might be argued that before the loan is repaid, war may break out. If such a contingency is viewed as probable, of course, one can only admit that it would be imprudent to extend credit.

[40] This applies to all trade barriers. The discussion here will be confined to tariffs. Other forms of discrimination against Soviet Bloc nations are in the administration of quantitative controls over imports, and in the unwillingness of some western nations to allow unrestricted transferability of Soviet Bloc holdings of their currencies.

cannot reciprocate MFN treatment in the conventional way. They either do not have tariffs to lower or, where double-column tariffs have been introduced by some communist nations in recent years, application of the lower set of rates has no automatic effect on either domestic prices or on total quantities imported, since prices and quantities are both directly determined by the planners.

Before World War II, the U.S.S.R. developed an *ad hoc* solution to this problem in bilateral negotiations with individual western nations by agreeing to increase imports (thereby simulating the effect of a tariff reduction) from any nation in return for MFN tariff treatment from that nation. Since World War II, this arrangement has been employed widely by the nations of Western Europe to extend MFN tariff treatment to the nations of Eastern Europe and the U.S.S.R. The United States is a striking exception to this practice. MFN status was withdrawn from all of the communist bloc nations in 1951 and restored in 1962 only to Yugoslavia and Poland. Without MFN status, imports into the United States from the remaining communist nations must pole vault over the very high Smoot-Hawley Tariff of 1930, an almost impossible barrier.[41]

Bilaterally negotiated MFN relationships of the kind just described, are very far from an ideal approximation of how MFN is supposed to work. For one thing, it is usually not easy to identify the increase in imports which corresponds to a given reduction in tariff rates. This is a minor point, however; presumably the negotiating nations can and do reach agreement. More important, the device fosters bilateralism and is contrary to the "equal treatment" and "anti-discriminatory spirit of MFN as it has developed under GATT. This is because, under bilateral negotiations, there is no attempt to ascertain and, perhaps no way to ascertain, whether the increase in imports by the communist partner truly represents a specific increase in its overall imports or simply a diversion of imports from other Western nations. Furthermore, and related to this point, any Western nation which is a member of GATT, would normally expect that if a nation lowers its trade barriers to one GATT member, it will lower them by the same amount to all GATT members. This multilateralization of trade barrier reductions is not involved, of course, in the bilateral negotiations between capitalist and communist nations.

One way around some of these difficulties was suggested by Alexander Gerschenkron many years ago[42] He argued that the U.S.S.R. should enter into negotiations not just with one western nation but with a large group of them simultaneously. In return for MFN status, the U.S.S.R. should agree to a global increase in its imports, which increase would be distributed among these nations on a basis of strictly commercial considerations. Apparently this suggestion has been adopted for it is reported ". . . that Poland was admitted as a full contracting party to GATT upon pledging an annual increment in imports from GATT members of at least 7 percent annually without a time limit . . ."[43] It is well worth noting that under present and

[41] This statement is relevant only to commodities subject to that Tariff. Many commodities are not, of course, and on these the communist nations can compete on an even footing.

[42] Alexander Gerschenkron, *Economic Relations with the U.S.S.R.*, New York, 1945 (published by the Carnegie Endowment for International Peace), pp. 37ff.

[43] Michael Kaser and C. F. G. Ranson, "Relations with Eastern Europe", in *Economic Integration in Europe*, ed. by G. R. Denton, London 1969, p. 93.

forseeable conditions, a Soviet Bloc nation which is granted MFN status is more likely than not to increase its imports as though it had agreed to an annual global increase—even if it had not. These nations with the exception of the U.S.S.R., hold almost no foreign exchange reserves, spending them as they earn them. Since intra-bloc trade is almost always perfectly balanced on a bilateral basis, foreign exchange earnings are spent in the West and presumably on the basis of commercial considerations except when discrimination is enforced by Western trading partners.

Poland's admission to GATT brings to three the number of Eastern European nations which belong. Czechoslovakia and Yugoslavia already were members; Rumania and Hungary are currently negotiating for membership. The Polish case does represent something of a breakthrough, however, for the "global quota" principle. Czechoslovakia was a member of GATT before it became a communist nation and holds its position through "heredity." Yugoslavia is a member by virtue of having converted to market socialism, thereby placing itself in a position to conform to MFN status by conventional means. Presumably, Hungary, with its advanced economic reforms, will attempt to follow the Yugoslavian road. Rumania and the other Soviet Bloc nations will be admitted, if at all, by the Polish formula. It is worth noting that the United States, presumably obligated as a member of GATT to grant MFN status to Czechoslovakia, does not do so.

The nations of the Soviet bloc have argued that they are entitled to MFN status. They claim that they do, in fact, grant equal treatment to all nations in trade. In their way of thinking, the long-term trade commitments which characterize intra-bloc trade and which lead to greater intra-bloc than East-West trade constitute an advantage to a centrally-planned economy of a commercial nature. Hence, the apparent preference of CPE's for intra-bloc trade cannot be designated discrimination, they argue, since it has a "commercial" base. Further, MFN and equal treatment are not absolutes. Customs unions like the EEC receive exceptional treatment. The less developed nations are allowed to discriminate when in balance-of-payments difficulties. Exceptions are made by advanced nations for protection of domestic agriculture. The U.S. and NATO nations discriminate against the communist nations under the Export Control and Battle Acts and this is sanctioned by GATT. And so on.

There is certainly some substance to this position. However, there are at least two major difficulties with it. First, when one considers the absolutely gigantic shift in trade patterns which occurred at the time communist governments were established in Eastern Europe, it is hard to escape the conclusion that this shift was politically motivated and could not be rationalized in terms of commercial consideration. Consider that intra-bloc trade which constituted less than 15 percent of the total trade of those nations in 1938, has been between 60 and 75 percent of the total since 1950! Second, it is impossible to verify the importance of commercial considerations in determining the direction of Bloc trade both because these considerations are by and large not quantifiable and because the trade barriers used by the Bloc nations are implicit, not explicit.

Clearly, there will be no easy solutions to the MFN problem unless market socialism comes to predominate among the communist nations.

Institutional differences between systems can only be imperfectly reconciled. Even the "global quota" technique, for example, probably results in some approximation to equal treatment in connection with increments to trade each year but does nothing in the short-run about the discrimination implicit in previously existing trade. Hopefully, as time passes, larger and larger percentages of Polish trade will come to be non-discriminatory. Unfortunately, there do not seem to be any superior solutions on deck at the moment. Given the differences in economic systems, one cannot expect the CPE's to multilateralize all of their trade, to give up their mutual trade agreements, or to institute drastic shifts over a short-time period in trade patterns. The dead hand of the past lies too heavily on their shoulders. At the moment, if western nations wish to use MFN to expand trade with the East, they can probably do no better than to adopt the bilateral and global quota devices described above.

The United State's unwillingness to negotiate MFN status with the communist nations (excluding Poland and Yugoslavia) can be analyzed very much in the same frame of reference that we have used to analyze control over exports and capital flows. I think it is fair to say that U.S. policy is basically an act of economic warfare, although from the preceding discussion it is clear that it could be rationalized on technical grounds relating to equal treatment and non-discrimination. In effect, we attempt to hurt the communist nations, economically, by depriving them of export markets. From this point of view, it is largely equivalent to our export and credit controls. Like these other policies, it is largely ineffective since we pursue the policy without the support of other nations. Further, while the case of Poland is exceptional, the policy generally does not take cognizance of political differences among countries in the Bloc. Thus it would certainly be an act of gross stupidity if this country, after its recent overtures of friendship toward Rumania, and in light of Rumania's independent posture in the Bloc, were unwilling to enter into negotiations toward an MFN agreement with that nation! Finally, of course, our policy does involve an economic loss to ourselves in the form of foregone cheaper or more desirable imports and, in return, foregone exports. While in the short-run these do not appear to amount to much, over the longer-run they might be not inconsiderable.

Dumping

The question of dumping by CPE's is a real one to western nations for one major reason. Because of planning difficulties, the CPE's often go to the world market to purchase commodities which they happen to run short of because of production failures or sudden changes in plan. To finance these extra purchases, attempts are made to export items which may be in temporary surplus supply or which are allocated to low priority use at home.[44] Additional exports are usually necessary because convertible foreign exchange reserves are very scarce. Because exporting is urgent, and because the returns from imports are so great under these bottleneck conditions, exporting becomes profitable even at prices which involve a nominal loss. Under these

[44] Oleg Hoeffding has written a fascinating account of how the Soviet Union financed emergency imports of wheat in the early 1960's. See his: "Recent Structural Changes and Balance-of-Payments Adjustments in Soviet Foreign Trade", in *International Trade and Central Planning*, ed. by A. Brown and E. Neuberger, Berkeley, 1968, pp. 312–336.

circumstances, western markets may suffer disruption. Disruption is worth tolerating of course, where it leads to the long-run supply of a product at lower prices to the purchaser; it is not worth tolerating where it is a one-shot deal—a possibility under the circumstances outlined.

It is almost impossible to tell when a CPE is exporting at below costs of production. It is easy enough, however, to judge when the CPE export price is below the market price of either domestic or other foreign suppliers. This is the comparison which must be relied upon, as a first approximation, to determine whether or not dumping is taking place. This is not sufficient evidence, however. For in order to enter Western markets, even with products which they are prepared to supply on a long-run basis, the CPE nations have often been forced to sell at below western prices. They do this not out of choice but out of necessity. Fundamentally, the foreign trade combines are profit-maximizers and their orders are to sell at as high a price as possible. They are not interested in market disruption for its own sake.

The problem, then, is to determine whether or not products which are being sold by CPE's at below normal market prices are a normal export or a crisis export. In the latter case, of course, the products should be subjected to a countervailing tariff under our anti-dumping laws. Generally speaking, however, where suspected dumping has been protested by injured enterprises in Western European countries, countervailing tariffs have not had to be resorted to—the problems have been ironed out through consultations. This has been particularly true of those Western European nations which have trade agreements with the CPE's. While we should be prepared to use our anti-dumping laws if necessary, it does not seem likely that such drastic action will often be necessary.

II. Potential Economic Gains From Trade Liberalization

There is a tendency to understate the possible gains to the United States from liberalizing trade with Eastern Europe and the U.S.S.R. because our trade with them has been so minute. In 1967, for example, our trade with these nations amounted to roughly $200 million each way (of which about 25 percent was with the U.S.S.R.), just a fraction of one percent of our total trade. In fact, if trade had not been so severely restricted over the past 20 years, the picture would undoubtedly be substantially different. In comparison, for example, Western Europe's exports and imports with the European communist nations in 1967 amounted to $4.4 and $6.4 billion respectively. It is impossible to say just what part of this trade would have fallen to American enterprise had it not been for the differential between ours and Western Europe's trade and credit controls, but it is not improbable that our exports might by now have reached close to $1 billion annually, our imports somewhat less. John Michael Montias recently pointed out that ". . . if this country could direct the same fraction of its machinery and equipment exports to the area as it did in 1928 these exports would rise from the present $64 million to $606 million . . ." [45] Using a technique which measured our general competitiveness with Western

[45] See his "Statement" before the Subcommittee on Foreign Economic Relations of the Joint Economic Committee on December 9, 1970.

Europe in markets for machinery, equipment, and metals and metal manufacturers in 1962, Mose Harvey came to comparable conclusions.[46] To these can be added, of course, hundreds of millions of dollars of exports of other products including our agricultural surpluses which could well compete with the very large Canadian and Australian exports to Eastern Europe, the U.S.S.R. and China. Liberalization of our trade policies toward the communist nations would enable us to gradually reassert our position in trade with them although it is unlikely that we would ever again recapture the total markets projected above.

Two other possible sources of increased exports exist. The extension of loans on acceptable terms would certainly lead to a roughly comparable expansion of exports. The second possibility is greater trade with the Soviet Bloc at the expense of intra-bloc trade. As we have already noted, intra-bloc trade presently amounts to more than 60 percent of their total trade. This is excessive by any measure. Any weakening of political ties within the Bloc or rationalization of foreign trade decisions is bound to increase East-West trade at the expense of intra-bloc trade. In fact, over the past 10 years, intra-bloc trade, as a percentage of the total, has declined by about 10 percent. Rumania's trade with the Bloc has fallen by an even larger percentage. The extent of possible gains to the United States at the expense of intra-bloc trade must not be exaggerated, however. First, we will have to compete with Western Europe for any diversion which develops. Second, any net increase in imports from the West by Bloc nations depends completely on additional sources of convertible currency obtained either through increased exports of the West or loans. The Bloc nations have not been notoriously successful in shifting their exports from East to West. Their competitive abilities have been blunted by the nature of their systems and their 20 years adaptation to meeting each other's needs under long-term trade agreements and in protected markets.

A substantial liberalization of trade controls could provide this nation with a special set of benefits which might be viewed as defense-related. Recall that after World War II, tariffs on imports of watches were presumably designed to protect that industry in order to maintain intact a labor force with specialized skills useful in defense industries in case of war. At present, there is a very high level of unemployment among engineers and scientists who typically are employed in high-technology and defense-related industries. This nation has many peaceful needs to which the talents of these people could be applied. Unfortunately, very little effort is being made along these lines and the situation is apt to get worse rather than better in the forseeable future. Liberalization of trade controls followed by appropriate marketing efforts could provide a substantial amount of employment for highly skilled workers in these categories and thereby prevent the deterioration of an important American defense-related resources, not to mention the gains to the individuals concerned as they are spared a serious psycho-social as well as economic adjustment.

So far, we have concentrated on the gains to be had from increased exports to the Soviet Bloc. The counterparts of these gains are to be had in two forms: more and cheaper imports and/or an improvement in our balance of payments position. Potential gains from both of

[46] Moses Harvey, *East-West Trade and United States Policy*, New York 1966, pp. 49-50.

these sources are obvious enough not to need elaboration here. It is perhaps worth noting that the nation in the Soviet Bloc from whom we import (as well as export) the most is Poland, the one nation in the group which enjoys MFN status with the United States.

III. Summary of Proposals

Basically, I am in favor of virtually ending the state of economic warfare which has existed between the United States and the communist nations since 1945. It is a negative policy which has, in my opinion, not added significantly to the security of this nation. We have little to lose and, possibly, much to gain from adopting positive policies. In fact, because other Western nations refuse to cooperate with us on restricting East-West trade, the major consequence of our policies is to inflict economic losses on ourselves—our business and consumers.

At least two changes should be made in our export control setup. First, Mainland China and Cuba should be put on the same footing as the other communist nations. The total embargoes on these nations are not achieving desired ends and are politically anachronistic—particularly the embargo on China. Second, I feel that as a minimum we should eliminate the "Cocom differential," that is to say, we should reduce our controls on exports to all communist nations at least to the same level of stringency as applied by Western Europe and Japan. More stringent controls than those enforced by other nations are ineffective and constitute, in effect, economic warfare by the United States Government against its own enterprises and labor force. Beyond this, I would favor removing export restrictions from all commodities except perhaps those embodying important new military technology and those embodying new technology for which it would be impossible to recover adequate compensation.

I am in favor of not using World War I or Lend-Lease debts as a basis for invoking the *Johnson Act of 1934*. World War I debts should be stricken from the books as bad debts. We should attempt to reach a settlement with the U.S.S.R. on Lend-Lease by either accepting her offer of $240 million or offering a settlement which is comparable with terms of settlement offered other allied nations, taking some account of the relative war losses suffered by the different nations. As with export controls, and for the same reasons, our credit and investment policies should be harmonized with those of Western Europe. U.S. private enterprise should be allowed to compete on even footing with enterprises of other nations in the extension of credits to facilitate exports and the construction of industrial plants in Eastern Europe and the U.S.S.R. This Government should not close the door to extension of credits to communist nations but should include the extension of loans in its arsenal of diplomatic tools. Loans could be granted to some communist countries and not to others or, preferably, on more favorable terms to some countries than to others. Adopting an open loan policy does not mean giving away something for nothing; we are after all always free to and should set terms which benefit ourselves economically as well as politically.

We should be prepared to negotiate mutual MFN status with some or all of the communist nations. This will harmonize our policies with

the nations of Western Europe and will also put us in a position to honor our obligations under GATT as more Eastern European nations are admitted, which seems probable in the near future.

The above measures make the most sense for this country when viewed as a package. For example, removal of export controls will probably not increase our exports significantly—but only redistribute them—if our exporters cannot compete on even credit terms with foreign exporters and if the communist nations are prevented by discriminatory tariffs from earning more dollars.

Since I am an economist rather than a lawyer, political scientist, or politician, my proposals are very general and should be viewed as judgments and sentiments based on economic analysis rather than as specific legislative prescriptions. Further, while my paper as a whole as well as my proposals concentrate on "our" policies rather than "their" policies, I do not mean to imply that we should necessarily take action unilaterally and without an attempt to obtain concessions from the other side. In fact, the most fruitful approach, it seems to me, would be for this nation to enter into commercial agreements with the various communist nations as envisaged in the proposed *East-West Trade Relations Act of 1969* in order to:

". promote constructive relations with Communist countries, to contribute to international stability, and to provide a framework helpful to private United States firms conducting business relations with Communist state trading agencies by instituting regular government-to-government negotiations with individual communist countries concerning commercial and other matters of mutual interest . . ."

Under such agreements, this country could provide for: increased markets for the products of both nations; ". . . satisfactory arrangements for the protection of industrial rights and processes; . . . the settlement of commercial differences and disputes; . . . facilitation of entry and travel of commercial representatives . . .[47] procedures to handle dumping charges; and so forth. Agreements of this sort have long facilitated trade between Eastern and Western Europe. I would hope that we would soon regularize our own economic relationships with the communist nations in a similar fashion.

IV. Postscript: Some Future East-West Trade Problems

A lot of water has passed over the dam since the first three sections of this paper were first published in July 1971. Political and economic relations with China are rapidly becoming normalized and will no doubt be on roughly the same footing as those with other communist nations in the very near future. While hard to believe, it is nevertheless a fact that American businessmen are negotiating with Chinese planners in Peking and American tourists are free, as far as our government is concerned, to travel in China and eat Peking duck at its breeding grounds. No less significant, a trade agreement between the U.S.S.R. and the U.S. has been hammered out and, if approved by the Congress (in the form of supporting legislation), will mark a significant break with the past. The agreement settles many outstanding issues and problems. Among other things, the Russians have agreed to third country arbitration of trade disputes and to provide Ameri-

[47] All quotes excerpted from provisions of *East-West Trade Relations Act of 1969*.

can traders with business facilities in Moscow at least as good as those of other foreign traders and the American Government with an official "U.S. Commercial Office." They have also agreed not to try to export to us commodities which might distress domestic American firms—a way of avoiding the dumping problem. We, in return, have agreed to extend MFN treatment to the U.S.S.R., to allow the credit facilities of the Ex-Im Bank to be used in trade with the U.S.S.R. and to otherwise help facilitate a trebling of U.S.-U.S.S.R. trade over the next few years. The Ex-Im Bank provision was dependent on a settlement of the Lend-Lease account, which settlement was certainly one of the major accomplishments of the trade agreement. From all accounts, Lend-Lease was the toughest nut in the package to crack, with the Russians apparently objecting to U.S. terms (as I did above) on grounds of equity and morality.

They finally agreed to a total payment of interest plus principal of $722 million with the final installment coming due on July 1, 2001.[48] Since the settlement of Lend-Lease was an essential condition to receiving MFN status and large U.S. long-term investments, it could be viewed, economically, as costing the Russians nothing over the short run (while American capital is flowing in) and possibly nothing over the long run, depending on the value to them of MFN and gains from increased trade with the U.S. This is undoubtedly one important reason why they finally agreed to settle despite reservations regarding equity and morality.

Although some of the more immediate obstacles to increased U.S.-U.S.S.R. economic relations have been reduced or eliminated, East-West problems remain. The remainder of this section will be devoted, therefore, to a brief look into some of these problems of the future. The topics to be discussed are: international monetary problems, joint investment projects, and in convertibility; comparative advantage and balance of payments problems; and commercial policies.

International Monetary Problems

If present trends toward economic and political detente continue, there will undoubtedly be interest and impetus, on the part of both Eastern and Western nations, to do something about Bloc currency inconvertibility. Just as the GATT has attempted to adapt its rules to the institutional peculiarities of communist trade, so it is likely that some attempt will be made to include the Eastern nations in the International Monetary Fund (IMF).[49] Further, mini-moves toward monetary integration are represented by the joint credit operations engaged in by Soviet overseas banks with Western banks and by the admission to the U.S.S.R. of branches of capitalist banks.

The real question is, however, whether the IMF can admit as full members (or, if admitted, does membership have real significance in the case of), a group of nations which conducts about ⅔ of its trade (intra-Bloc trade) on what amounts to a barter basis, whose currencies are as inconvertible as any currency in history, and whose exchange rates are accounting units but not true prices and serve no function in

[48] A White House "Fact Sheet" on the Trade Agreement suggests that the USSR received harsher terms that the U.K. with regard to interest rate, period of repayment and percent of Lend-Lease deliveries which had to be repaid. These harsher terms may be explained by the fact that the British settlement was made 25 years ago when prices were much lower.

[49] Since this was written, Rumania was admitted to the IMF (December 1972).

regular international trade. East-West trade itself is not a really serious problem since the communist nations are willing to trade at world prices and to use foreign exchange earned in trade with one Western nation to finance deficits with others, i.e. trade is relatively multilateral. In this regard, the communist nations are not too much different from most small Western nations which conduct the bulk of their trade in key currencies rather than in their own. But East-West trade is strictly bilateral and there appears to be little reason to believe that things are going to change in the near future. Certainly, the establishment in 1964 of a Bank for International Economic Cooperation (IBEC) with its so-called "transferable" ruble had no impact whatsoever on the problem as could have been predicted.[50] The Comecon "Comprehensive Program" of 1971 says little about problems of inconvertibility and bilateralism and what it does say smacks of wishful thinking rather than effective therapy. As noted earlier, the distinctive feature of the communist problem is not currency inconvertibility but what has been called commodity inconvertibility. Currency inconvertibility is the garden variety capitalist-type disease and can be cured (temporarily at least) by devaluation. This is not the case with commodity inconvertibility. As we noted, the exchange rate is not a real price in the case of countries which suffer from commodity inconvertibility—hence devaluation is meaningless and has no effect on trade; trade is conducted at world prices regardless of domestic prices and official exchange rates.

The one sure solution to commodity inconvertibility which comes to mind [51] is the drastic one of economic reforms which involve decentralized planning including the opening up of domestic markets to foreign buyers and sellers and concomitantly, of course, the establishment of rational internal prices organically linked to world prices via a real exchange rate. Such a decentralization would solve the commodity inconvertibility problem fundamentally—by removing its causes. The Hungarian economic reform has involved considerable decentralization of internal transactions, and some rationalization of domestic prices. As yet, however, it has not gone far enough to meet the conditions necessary to eliminate commodity inconvertibility. The reforms of the other communist nations, particularly that of the U.S.S.R., involve even less of a substitution of market mechanisms for direct controls. At this point, it seems highly unlikely that the U.S.S.R. will adopt far-reaching reforms in the foreseeable future. Their relatively small involvement in international trade (Exports/GNP and Imports/GNP each less than 4 percent) reduces the impetus from a sector which has loomed large in the reform plans of the smaller communist nations.

The important question which comes to mind is whether it would be possible for any or all of the Eastern European nations to decentralize sufficiently over the next decade to eliminate commodity inconvertibility at the same time that the U.S.S.R. (and some of the others) did not. My feeling is that it would be impossible unless the U.S.S.R. were willing to stand by and see the cohesiveness of the Soviet Bloc as a trading group rapidly eroded. Any nation which adopts drastic enough reforms to eliminate commodity inconvertibility is going to be in a position in which its trade decisions will be made by thousands of en-

[50] Cf. Holzman, "Foreign Trade Behavior," 1966.
[51] Other possible solutions were proposed and rejected in *Ibid.*

terprise managers and on the basis of market criteria. This will automatically lead over time to a substantial diversion of this nation's trade from East to West as the managers find that for the most part they can make much better deals (especially in imports) in capitalist than socialist markets. This result is to be expected since the high level of intra-bloc trade is due, in the first instance, to state controls over trade, controls which discriminate heavily in favor of other bloc nations. It might be averted by levying very high discriminatory tariffs against Western suppliers or by the introduction of quotas on Western goods. However, the levy of high discriminatory tariffs or quotas would put the Bloc nations in trouble with GATT: and the introduction of stringent quotas, furthermore, would essentially reverse or substantially weaken the impact of the economic reform on the nation's trade problems. Since the Bloc nations conduct about ⅔ of their trade with each other, an economic reform in the foreign trade area only makes sense if this figure is substantially whittled down so that most of the reforming nation's trade is conducted on competitive markets and guided by market criteria. I do not believe that the U.S.S.R. is ready at present to allow the dissolution of their trading bloc and I feel, therefore, that internal economic reform is not a politically feasible solution to commodity inconvertibility in the foreseeable future. Further thought will have to be devoted to this problem if the communist nations are to be admitted to the IMF in the near future and are to function as regular members.

Joint Investment Projects and Inconvertibility

There is one other international monetary issue which deserves to be raised, particularly in light of the recent increase in Western capital investments in the USSR and Eastern Europe. It is worthy of note that while East-West (as opposed to intra-Bloc) commodity trade is largely "monetary" and multilateral, East-West joint investment relations are expressed "in kind." That is to say, Western investors typically take their interest, profits and repayments in the commodities which result from the investment rather than in convertible currencies or gold. While this is simple to arrange in cases in which foreign investment leads to easily-exportable stable-valued products (natural gas, petroleum), it is certainly not appropriate to the broad spectrum of possible investments and therefore must be viewed as sub-optimal.

Why is it that while East-West trade is "monetary," East-West investments are not? The major reason would appear to be what amounts in Western trade relations to an exchange rate risk. While the exchange rate risk is a serious one to those who hold the currency and bonds of another Western country, it is minimized for direct investors. The direct investors are largely protected against this risk by the fact that if a devaluation is necessitated by inflation, the probability is good that the value of the investor's holdings will have risen along with the value of everything else. The Western investor in a communist country receives no such protection and faces problems more similar to those of the Western currency holder. If an investment arrangement with a communist government were to be stated in monetary rather than real terms, it would have to be denominated in a Western currency (usually the investor's own currency or a "key" currency) since,

as noted above, communist currencies are inconvertible and internal prices are irrational and unrelated to world prices. If prices rise in the country whose currency is being used as medium of exchange and standard of deferred payment, then the investor suffers an equivalent loss (and regardless of whether the exchange rate regime is fixed or flexible) since the value of his investment in the communist country does not automatically rise commensurately.

In absence of other safeguards (see below), this analysis suggests that the more stable a nation's price level and currency, the more likely would its businessmen be willing to undertake investments in communist countries with repayment in currency. This hypothesis parallels that of Robert Aliber who argues that a major factor determining the country origin of capitalist direct foreign investment is the relative premium on various currencies: the higher the premium on a currency, the more acceptable and profitable is direct capital investment from the country in question.[52] This parallel should not be stretched too far, however, because the investor in a communist country is much more vulnerable to loss as a result of chronic inflation in all Western industrial nations. In fact, it is unlikely that Western investors would often accept repayment in Western currency without protection against the exchange (price) risk.

How can such protection be achieved? One possibility is to denominate contracts in gold with payment to be made in an equivalent value of any convertible currency. For this system to provide a proper hedge against inflation, the price of gold would have to fluctuate reciprocally with the values of the various national currencies. This has not been the case. Until recently, at least, par values in gold have changed infrequently despite substantial over- and undervaluation of different currencies. Further the relation between the price of gold and various major currencies has been erratic and has, in any case, not reflected movements of internal national prices. For example, the German mark was recently revalued upward against the dollar which was perfectly proper in terms of the balance of payments positions of the two nations and of the more rapid inflation in the U.S. On the other hand the revaluation raised the value of the mark in terms of gold—despite internal price increases in Germany![53]

One other solution to the exchange risk problem is to include in contracts a provision which escalates the value of interest and repayments for price level increases in the nation whose currency is to serve as medium of exchange. This type of inflation hedge device has a long and respectable history.[54] It clearly provides the investor with adequate protection. And the debtor nation is not unfairly disadvantaged by this arrangement since presumably its export earnings in the currency in question will be appropriately increased. There is one caveat to this latter statement, however, and that is that the currency in

[52] Robert Aliber, "A Theory of Direct Investment" in *The International Corporation*, ed. by Charles Kindleberger, Cambridge, 1970.

[53] Exchange rates reflect capital flows, unilateral transfers, and other factors not directly reflected in commodity prices and this destroys the purchasing power parity relationship between gold and exchange rates of currencies. Even more important, until a few years ago the price of gold in terms of most currencies rose much more slowly than internal price levels.

[54] Cf. this writer's "Escalation and Its Use to Mitigate the Inequities of Inflation" in Joseph Conard (editor), *Inflation, Growth and Employment* (Commission for Money and Credit), New York, 1964.

question must not be substantially overvalued. If it is overvalued, its exchange rate reflecting the full extent of its price inflation, then the debtor nation will find that its exports to third Western nations will not have risen sufficiently in value to compensate for the price rise in the creditor nation. This problem would not arise, of course, under a floating exchange rate regime.

To sum up, some technique will have to be devised to circumvent the barter-over-time problem if East-West investment relations are to reach a high level of fulfillment.

Comparative Advantage and Balance of Payments Problems

With the signing of the U.S.–U.S.S.R. trade agreement and the opening up of relations with China again, American businessmen are extremely optimistic over the future of East-West trade. Certainly, the relaxation of trade restrictions by all parties concerned will lead to some increase in mutual trade.

Many observers are concerned, however, by the fact that the Eastern nations seem to want much more from the Western than vice versa. Specifically, they want grain, technologically advanced machinery and equipment, and capital (that is they want to buy on medium- and long-term credits). The Western nations are willing to buy light industrial products and over the long-run will be interested in purchasing raw materials, most of which will have to come from the U.S.S.R. Without going into greater detail here, it seems clear that Western exports will substantially exceed Western imports over the next few decades (if credits are forthcoming) unless the Eastern nations curb their appetites with import controls. Many economists despair that an East-West trade "equilibrium" will ever be possible and even question the future ability of the Eastern nations to repay any substantial amount of credit.

Like the arguments of the "dollar shortage" school of two decades ago, it is hard to square these conclusions with a foreign trade theory which tells us that every country has a comparative advantage in some products and disadvantage in others. Perhaps the law of comparative advantage has been repealed for non-market economies! Apparently not for the U.S.S.R., at least. The two Leontief-paradox type studies done for that nation [55] both show that its trade, in aggregate as well as in particular markets, has factor proportions which make sense in terms of a Heckscher-Ohlin model.

The comparative advantage model is, of course, fairly abstract and, to be useful in interpreting actual phenomena, must be modified for many real world conditions including such obstacles to trade as costs of transport, tariffs, and so forth. There is a major obstacle to Soviet Bloc exports and that is their inability to "sell the product" because of difficulties in adapting to the special requirements of Western buyers, low quality, poor packaging, poor servicing of equipment, inadequate advertising, and so forth. This is not the place to go into these problems in detail. Let it suffice to say here that they are deeply rooted in central planning and have to do with the existence in these nations of perennial seller's markets as well as, in the foreign trade

[55] Carl McMillan, *Aspects of Soviet Participation in International Trade,* unpublished doctoral dissertation, Johns Hopkins University, 1972;
Stephen Rosefielde, *Factor Proportions and the Commodity Structure of Soviet International Trade, 1955–68,* unpublished doctoral dissertation, Harvard University, 1972.

area, with the fact that foreign trade combines rather than producers of exportable products are the ones who are in contact with Western buyers. The result of all this is an asymmetrical frustration of comparative advantage in East-West trade similar to that which would be created if the West levied high tariffs or quotas on Eastern products whereas the East place no barriers at all on imports of Western products. This is certainly part of the explanation of poor balance of payments position of the East in East-West trade.

The argument is reinforced by a second related consideration. In the days of the "dollar shortage", it was argued that the problem was partly a result of the great innovative capacity of the United States which served to improve its competitive advantage in world markets vis-à-vis Western Europe. In effect, dynamic factors constantly intervened to prevent comparative advantage from asserting its stabilizing influence. More recently, Raymond Vernon, in his product cycle paper,[56] has argued that the innovators quickly lose their markets to lower cost (i.e. lower wage) imitators and, after a few years, find themselves importing product they formerly exported and from the same nations. In terms of our argument, the balance between innovator and imitator is maintained, at least in part, by the innovators coming forth with new products as fast as they lose old ones. Now the Communist Bloc nations are not notorious innovators. While they do innovate, they have more commonly played the role of imitator. As imitators, they have not been particularly efficient, as have, for example, the Japanese. One does not find Bloc nations firing products embodying a four-year-old technology back to the West as exports. This statement is reinforced by factors mentioned in the previous paragraph. What this suggests is that the Bloc nations are in a constantly moving disequilibrium in terms of dynamic comparative advantage such as was envisaged for Western Europe vis-à-vis the United States some twenty years ago.

A "net comparative disadvantage" could not be the whole explanation in the capitalist market model of trade because, once money and exchange rates are superimposed, it becomes impossible to achieve equilibrium regardless of comparative advantage, via balance of payments adjustment mechanisms. Unfortunately, these mechanisms are not all available to the centrally planned economies, a factor to which must be assigned major responsibility for the balance of payments problems of these nations. Put quite simply, a nation with commodity inconvertibility cannot devalue its currency by altering its exchange rate and thereby improve its balance of payments. As noted above, the communist nations trade at world prices which are not related to internal prices through their official exchange rates. The official exchange rates are not real prices and changes in these rates have absolutely no effect on trade. A nation which has balance of payments problems and cannot effectively devalue its currency has lost an important instrument variable.

Inability to devalue is not particularly important in the case of imports since a planned economy can always limit imports by imposing quotas. The real problem is with exports—which are a problem in their own right as noted above. At first glance it might seem reasonable to

[56] Raymond Vernon, "International Investment and International Trade in the Product Cycle", *Quarterly Journal of Economics*, May, 1966, pp. 190–207.

argue that if it is not possible to expand exports by lowering prices through devaluation, why not just simply price exports at below world prices as they would be if devaluation were possible? Unfortunately this recourse is not available either to the communist nations since they would find themselves running afoul of western anti-dumping laws. Given their irrational prices, it would be very difficult to refute dumping charges even when the commodities in question were not being sold at true loss.

Another factor which in the absence of effective balance of payments adjustment mechanisms creates chronic balance of payments pressures is the fact that the Communist Bloc of nations constitutes, in effect, a relatively high-cost economic region or customs union in comparison with the rest of the world community. This is largely due to their relatively small size, isolation from the world market and policy of concentrating their trade among themselves. Before World War II, the nations of Eastern Europe and the USSR conducted about 15 percent of their trade with each other. In comparison, the comparable percentage in recent years has been between 65 and 75 percent. These figures imply that Comecon is the Communist counterpart of a trade-diverting customs union which leaves its members producing for each other at higher costs than would have been the case had the customs union not been formed. This conclusion is probably deducible also from the fact that the trade and output of these nations is a relatively small part of the world totals and that they therefore produce a smaller variety of products and at a higher cost. If one views Comecon as a small and high-cost enclave in the world economy, it follows that any relaxation of controls or mutual lowering of barriers to trade between East and West will lead to more imports by East than by West. This process will continue so long as the East-West barriers exceed East-East and West-West barriers.

There is still one further explanation of the balance of payments problems of the Eastern nations, namely the chronic practice of "taut" or overfull employment planning. Overfull employment planning means that planned demand exceeds available supplies. Under these circumstances domestic producers and consumers will fight for exportables and more imports and thereby create pressures, which if at all successful, will cause deterioration in the balance of payments. The "absorption" approach suggests that even a devaluation is unlikely to improve the balance of payments under these conditions. Balance of payments "equilibrium" is unlikely to be achieved so long as plans remain so taut.

What is the solution, if any, to the chronic balance of payments pressures? To this observer, it would seem that the only way to eliminate the balance of payments effects of the first four difficulties mentioned above is to institute drastic economic reforms—although some ameliorative action may be possible short of such reforms. In principle, it should be possible to eliminate the fifth—overfull employment planning—even under central planning with direct controls. Nevertheless, it should be noted that although Soviet and East European economists have been aware for at least 15 years of the dysfunctional

espects of "taut" planning, the problem has never been remedied.[57] It should also be noted that the case of Yugoslavia demonstrates that drastic socialist economic reform, while perhaps removing some of the causes of chronic payments disequilibrium, is nevertheless no panacea.

State Trading

As noted above, the next 20 years are likely to see a substantial expansion of East-West trade and investment. Such a development would have been hard to envision 20 years ago not only because of the political climate but because a central concern of the Western nations at that time was to achieve the goal of universal, free, multilateral trade. "Rules of the game" were established by GATT and the IMF and some progress toward the ultimate goal was made.

The great expansion of East-West trade in the past decade and the prospects for future expansion are all to the good. This is especially true of that expansion which has occurred as the result of the dismantling of discriminatory controls. On the other hand, it should be recognized that extension of MFN to the communist nations does not guarantee non-discrimination. Further, expansion of East-West trade has depended, and will continue to depend, on trade agreements and state trading as a device for bridging the institutional gaps between the two blocs. These agreements usually involve large package deals including many purchases and sales which are not based on commercial considerations. As Alec Nove has put it, there are Italian but no British cars in Budapest because "... the Italians demanded a quota for cars in their bilateral agreement and the British did not."[58] This is not to say that intra-Western trade is simon-pure. Thus, when President Nixon met with the Premier of Japan in September, 1972, he was able to return home with guarantees that the Japanese would buy certain American products and would limit competition in our market of other products! Nevertheless, since Communist Bloc trade is conducted exclusively by state trading bodies, the presumption is that deviations from the "rules of the game" are much more prevalent in East-West trade.

At present the seriousness of this problem is minimized by the fact that East-West trade amounts to less than 5 percent of Western trade. Should this trade expand rapidly over the next decade, its impact on liberal trading practices and goals could be significant. Clearly some work needs to be done on how to achieve non-discrimination in the context of government trade agreements. And the Western industrial powers should take some time out from competing for Eastern markets in order to develop and agree to adopt a common code of operation in trade with the Eastern nations which conforms as much as possible with the trading principles that have served to guide Western trade conduct in the past.

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[57] For some possible reasons why, see this writer's "Some Notes on Over-Full Employment Planning, Short-Run Balance, and the Soviet Economic Reforms," *Soviet Studies*, October, 1970.

For evidence that the present (ninth) Soviet Five Year Plan is too taut, see Gregory Grossman, "From the Eighth to the Ninth Five Year Plan," in *Analysis of the USSR's 24th Party Congress and 9th Five-Year Plan*, ed. by Norton Dodge, Mechanicsville, Md., 1971.

[58] Alec Nove, "East-West Trade" in P. Samuelson (ed.), *International Economic Relations*, New York, 1969, p. 111.

SOVIET PAYMENTS PROBLEMS IN TRADE WITH THE WEST

By JOHN T. FARRELL

CONTENTS

I. INTRODUCTION

Soviet foreign trade has grown rapidly in recent years, averaging almost 10% in the last 5 years and reaching a total turnover of $26.3 billion in 1971. Communist countries account for almost two-thirds of this trade, Eastern Europe alone taking up about 55%. Of the one-third of Soviet trade conducted with non-Communist countries, the Developed West accounts for about 21% and the less developed countries (LDCs) the remainder (see Table 3 in Appendix).

The area of greatest growth in recent years has been that of Soviet trade with the Developed West. The USSR values trade with the Developed West. largely because of the Soviet need for Western equipment and technology and other materials in short supply in the USSR. In a drive to overcome its technological lag *vis-a-vis* the West,[1] the USSR has expanded its imports from the West but has been unable to generate a corresponding expansion of its exports to that area. As a result, the USSR has consistently run a trade deficit. Because all the developed Western countries trade with the USSR in convertible currency (except Finland and Iceland) and very little Soviet hard currency trade is carried out with other countries (LDCs), the ensuing discussion equates Soviet hard currency trade with Soviet-Western trade.[2] Soviet trade with the West and selected Western countries is shown in Table 4 in the Appendix.

II. RECENT TRENDS IN COMMODITY TRADE WITH THE WEST

Soviet trade with the West traditionally has featured the exchange of Soviet fuels, raw materials, and semimanufactures for Western machinery and other manufactures (see Tables 5 and 6 in the Appendix). Despite efforts to diversify the range of products and to expand exports of manufactured goods to the West, Soviet export

[1] Developed West and West are used interchangeably.
[2] In 1971 almost 90% of Soviet hard currency trade was with the developed countries, the remainder with the LDCs, e.g., Malaysia.

earnings in the West still come principally from the old standbys—oil, coal and coke, wood and wood products, cotton, metals, diamonds, and other goods of the raw or semiprocessed variety. In the period 1960–70, Soviet exports to the West grew at an annual rate of 8.2%, growing from less than $1 billion to $2.3 billion. In 1971, exports made their best showing in years, rising 15.6% to $2.7 billion.

Crude oil and petroleum products—the major Soviet export earner in the West in the 1960s—increased greatly in value in 1971, largely because of substantial price increases, going from $528 million in 1970 to $757 million. Exports of coal and coke and wood and wood products had more or less leveled off until recent price rises improved their performance in 1970–71. Cotton fiber exports rebounded from a low of $37 million in 1970 to about $90 million. Exports of metals—particularly platinum group metals and nickel—and gem diamonds have increased greatly in recent years. Ferrous metals have remained fairly constant since 1965, but in that same period exports of nickel have almost doubled to about $75 million and platinum group metals have reached almost $100 million. Gem diamonds have come from almost nothing before 1965 to an estimated $250 million in 1971.[3]

Soviet imports from the Developed West feature machinery and equipment, accounting for an average of 40% of such imports. Chemical equipment has been a leader in this area for years, averaging about $140 million a year in the 1960s, but automotive manufacturing equipment has been at or close to the top of this category since 1969. Imports of metals—mostly steel and pipe—declined in the mid-1960s, but have gone up again since 1970, reflecting pipe deliveries for various Soviet projects to build gas pipelines, with West European countries to receive Soviet natural gas in return.

Consumer goods were not an important element in Soviet imports from the West until the large wheat imports in the early and mid-1960s. After the wheat imports declined in 1967, manufactured consumer goods took up the slack and by 1971 imports of these goods increased to almost $300 million.

III. Soviet Hard Currency Trade Problems

As a result of Soviet inability to expand its exports to hard currency countries rapidly enough to pay for growing imports, the Soviet trade balance with these countries has been in deficit throughout the period 1960–71, averaging about $250 million per year. In 1972 large imports of Western grain contributed to a record deficit of about $1 billion. Until the mid-1960s, these deficits were financed primarily by gold sales and, to a lesser extent, by Western government-guaranteed medium-term credits. Inadequate grain harvests in 1963 and 1965 and the consequent substantial imports of grain from the West resulted in a massive drain on Soviet gold reserves, reducing them to about 1,000 tons by the end of 1965. (See Table 7 in the Appendix.)

Dwindling gold reserves and the greater availability of Western credit resulted in increased use of Western government-guaranteed medium- and long-term credits, which replaced gold as the chief element in financing the Soviet deficit with the West. In the period 1966–71, Soviet gold sales were virtually nil and Soviet gold reserves

[3] Platinum group metals, nickel, and diamonds are not identified in Soviet statistics, but the above estimates are derived from Free World statistics and analysis of the Soviet unspecified categories.

grew to an estimated 1,900 tons [4] by the end of 1971. During this same period, the USSR drew down an estimated $3.1 billion in such credits. As a result, the estimated Soviet medium- and long-term debt to the West grew rapidly, from an estimated $400 million at the end of 1965 to about $2 billion at the end of 1971 (see Table 8 in the Appendix).

Despite the extensive use of Western credits and the rapid growth of its outstanding debt, the Soviet debt service ratio has risen only from 11% in 1967 to 18% in 1971 (see table 1 below).

TABLE 1.—DEBET BURDEN OF THE U.S.S.R.

Year	In millions of U.S. dollars		Debt service ratio [2] (percent)
	Hard currency exports	Debt service [1]	
1960	768	39	5
1961	900	76	8
1962	951	116	12
1963	1,012	144	14
1964	1,073	162	15
1965	1,374	166	12
1966	1,517	169	11
1967	1,711	181	11
1968	1,909	253	13
1969	2,125	327	15
1970	2,197	398	18
1971	2,652	483	18
1972 [3]	2,900	563	19

[1] Payment of principal and interest.
[2] Ratio of debt service to hard currency exports.
[3] Preliminary.

This slow rise is related to an increasingly large proportion of long-term credits outstanding relative to medium-term credits, the former now accounting for about 90% of the total. Most Western banks and governments probably would consider a debt service ratio on the order of 25% a reasonable level for the USSR. Among other things, the USSR's financial reputation and substantial gold reserves give it a prime credit rating in the eyes of Western banks and governments.

IV. Developments in 1972

Major developments in Soviet trade with the West in 1972 were the conclusion of the US-Soviet trade agreement, the contracts for Western grain totaling $2 billion, and the largest volume of contracts concluded for Western machinery and equipment in Soviet history. The impact of these developments will be felt mainly in 1973 and beyond and has major implications for US-Soviet trade. The bulk of the grain contracts ($1.3 billion) and a sizable portion of the machinery and equipment contracts went to US suppliers (see Table 2). The trade agreement itself called for a tripling of US-Soviet trade turnover for the three-year period of the agreement (1973–75) in comparison with the US-Soviet trade turnover of about $600 million for 1969–71.

[4] With the two-tier gold system this reserve totaled $2.3 billion at the then official price of $38 per ounce, but its value was much greater at the more realistic free market price.

TABLE 2.—SOVIET ORDERS FOR PLANT AND EQUIPMENT FROM THE DEVELOPED WEST BY SELECTED COUNTRIES[1] 1971–72

[In millions of U.S. dollars]

	1971	1972
Total[2]	841	1,965
United States	239	465
France	76	391
West Germany	147	358
Italy	66	169
Japan	138	155
United Kingdom	118	78
Other	57	349

[1] Excludes Finland, which is not a hard currency trading partner of the U.S.S.R. The 1972 total, however, includes a $151 million contract with Finland, its first with the U.S.S.R. in hard currency.
[2] These totals represent a high percentage of Soviet orders in the West, but it is assumed that available sources of such information do not include all contracts concluded.

In 1972, a total of about $600 million in grain was imported from the West, of which about $300 million resulted from the $2 billion ordered in mid-1972. Increased imports of machinery and equipment and steel pipe also helped to generate a deficit in Soviet hard currency trade of about $1 billion. The US share of this deficit was significant—about $450 million. The US exported $547 million in goods to the USSR in 1972 and imported about $95 million worth, thus making the US one of the USSR's major Western trading partners for the first time in almost 25 years.

The developments in 1972 also ensured that the 1972 deficit would be surpassed the following year. In 1973, about $1.7 billion in grain, more than $100 million in sugar imports, increased imports of machinery and equipment, and a high level of steel pipe imports are scheduled for delivery. The USSR also may be forced to contract for additional grain in 1973, thereby generating a deficit of even greater magnitude than now anticipated.

Financing the Deficits

The USSR has used a variety of methods of financing its hard currency deficits—gold sales, Western credits, cuts in imports of lower priority goods, and other trade adjustments which the USSR, with its monopoly control of trade, can effect more easily than market economies. Since 1966 the burden of debt financing has rested largely on Western credits since the USSR sold little gold in this period. Thus, the USSR faces a future with a large and rising debt brought on by export weaknesses and rising import needs.

The USSR is well aware of its debt build-up and realizes the need to lessen the burden of its debt service. As a result, many of the longer term credits being negotiated by the USSR are for large development projects where the repayment is deferred until it can be made with the product of the project being developed. Examples of this type of credit are the pipe and equipment contracts made by Austria, West Germany, Italy, and France for repayment in Soviet natural gas and

the Soviet-Japanese timber deals. In the contracts calling for Soviet gas deliveries in exchange for Western large diameter pipe and pipeline equipment, the USSR has received large deliveries of equipment on hard currency credits varying from five to ten years in length. In most of these contracts, Soviet repayment is to be made in deliveries of natural gas under separate but related contracts, which generally run for at least 20 years and will bring the USSR increased hard currency earnings after amortization of the equipment credits. Similarly, the Soviet-Japanese timber projects, including the port development at Vrangel Bay, are to be repaid in Soviet wood and wood chip deliveries. Concluded self-liquidating credits presently total almost $1.3 billion—$1,005 million in pipe and pipeline equipment and $260 million in equipment for Siberian timber and port development. By the end of 1972, an estimated $800 million worth of these credits had been drawn by the USSR and almost $200 million repaid.

In addition to the government-guaranteed, medium- and long-term credits used by the USSR in 1966–71, short-term credit facilities in the Eurocurrency markets have been utilized extensively. The USSR has been active in the Eurocurrency market, and its banks in Western Europe—Moscow Narodny Bank (MNB) in London, Banque Comcerciale pour l'Europe du Nord (BCEN) in Paris, Wozchod Handelsbank, A.B., in Zurich, and Ost-West Handelsbank in Frankfurt—have been useful in attracting short- and medium-term money.

As one would expect, the Soviet-owned banks also finance directly some Soviet imports from the West. The financing of Soviet imports by these banks is similar to that offered by any large Western bank handling international payments. Quite often they participate with other Western banks in financing Soviet imports. Because of their limited resources, the Soviet-owned banks generally restrict themselves to short-term financing. MNB, for example, handles a large volume of documentary credits for the USSR.

V. Special Financing Problems in 1972–73

The huge Soviet grain purchases in 1972 created special financing problems for the USSR. Of the 29 million tons of grain and soybeans contracted for, most will be delivered in 1973. Continued large imports of machinery and equipment, large-diameter pipe, and other Western products led to a hard currency deficit estimated at about $1 billion in 1972, but this deficit will be dwarfed in 1973 as payments comes due for the $1.3 billion in grain and soybeans still to be delivered from the 1972 contracts and increased deliveries of machinery and equipment, which are expected to grow following a huge upturn in Soviet orders from the West in 1971–72.

Credits from the West are not adequate by themselves to take care of Soviet financing needs. To help finance the large 1972 deficit, the USSR resumed large-scale sales of gold. Reported Soviet sales of roughly 150 tons of gold on the free market, where prices ranged from about $50 to about $70 an ounce, probably brought $250–$300 million. Prices remained high in spite of the Soviet sales because South Africa, the major supplier, withheld about one-third of its normal volume.

The Western credit market also broadened for the USSR in 1972. The agreements with the US in 1972 included an initial approval of

up to $500 million in Commodity Credit Corporation (CCC) credits for grain purchases and executive approval for Export-Import Bank participation in commercial credits for the USSR. In addition, a number of US banks have indicated a willingness to grant commercial, nonguaranteed loans to the USSR. Japan, too, for the first time made large credits available to the Soviets by approving loans and guarantees. These government guarantees and loans from the US and Japan open large areas of available credits at rates which are now competitive with Western Europe. Short and medium-term nonguaranteed credits presumably are also readily available in the Eurocurrency market at present.

The principal financing for these deficits is still expected to come from Western credits, particularly government guaranteed credits for machinery and equipment imports and US credits for grain purchases. Of the US CCC credits of $500 million made available, about $100 million were used in 1972 and the remaining $400 million probably will be used in 1973. An estimated $500 million of the 1973 deficit will be financed under credits guaranteed by various Western governments. The balance of the anticipated deficit could be financed through short and medium-term financing on Western money markets. Some credits might also be available to the USSR from CEMA's International Bank for Economic Cooperation, which in 1972 borrowed or received commitments for medium-term Eurodollar funds of at least $140 million. Should these prove to be insufficient, Soviet sales of gold will be resumed in 1973.

VI. Prospects for Hard Currency Trade

Soviet hard currency deficits should continue after 1973, but at a reduced level, barring another agricultural disaster. The probable conclusion of some large plant and resource development contracts now under negotiation should keep Soviet imports of machinery and equipment at a high level. In addition, the commitment to upgrade the diet of Soviet consumers indicates that Soviet purchases of feed grains will continue.

To assure adequate hard currency supplies in the long term, the USSR is trying to develop export-oriented production, financed by credits which will be repaid from the new production. Already in 1973, self-liquidating contracts account for about 20 percent of Soviet repayments on an estimated outstanding long- and medium-term debt of more than $3 billion. Many of the large joint ventures the USSR is discussing and negotiating with the West—the proposed LNG deal with the US and a variety of oil, gas, and mineral development projects—call for self-liquidating credits. Another important contract, but not for resource development, is the $650 million steel complex being negotiated with West Germany—a project which normally would be covered by straight hard currency commercial credits such as those for the Kama truck plant—where the German credits will be repaid by deliveries of iron ore pellets from a Soviet reduction plant associated with the complex. These contracts, if concluded, however, will not generate exports for years to come, and in the meantime Soviet hard currency exports will probably grow relatively slowly.

Soviet attempts to improve sales of manufactured goods have made little headway, and prospects for such increases in the near future are not good. For a few items where the USSR has made a real effort or has a saleable product—aircraft such as the YAK–40, TU–144, and helicopters; large-scale power generating equipment; and hydrofoils—it has made some progress. In general, however, the USSR seems unwilling or unable to tailor its manufactured exports to Western markets or to provide the servicing necessary to maintain sales.

Given the relatively poor prospects for the USSR to eliminate its hard currency deficits while maintaining its present import policies, a question arises as to the ability of the USSR to continue expanding its debt to the West. The USSR has succeeded thus far in financing its debt, but in the longer run, it will have to expand its exports at a more rapid rate or its import capacity will be reduced. At the current rate of growth of exports of about 7 percent the Soviet debt service ratio could reach 24 percent in 1973—a substantial burden by any measure. Moreover, the continued rise in credit repayments could lead in a few years to a net outflow on capital account. These two factors—net outflow in credits and slowed growth of exports—would seriously reduce Soviet ability to pay for imports.

If Soviet needs for Western agricultural products return closer to the 1967–71 levels, hard currency stringencies would be alleviated. The USSR is well able to carry a fairly large debt service burden, particularly if an increasing share is taken up by self-liquidating credits which will lead ultimately to a growth of hard currency exports. At the same time, it must be willing to sell gold. Some 200 tons or more can be sold annually without reducing reserves.

Appendix. Commodity Trade Data

Note.—Commodity trade data for the periods 1960–69 are based on the 1972 nomenclature and the data for 1970–71 are based on the 1971 nomenclature. As a result, the series for some commodity groups may not be consistent.

TABLE 3.—U.S.S.R.: GEOGRAPHIC DISTRIBUTION OF TRADE

[In millions of U.S. dollars]

	1960		1961		1962		1963		1964		1965	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Total [1]	5,564	5,628	5,998	5,828	7,031	6,455	7,272	7,059	7,683	7,737	8,175	8,058
Communist countries	4,211	3,978	4,321	4,147	4,905	4,566	5,099	4,986	5,407	5,346	5,556	5,610
Eastern Europe	3,074	2,795	3,400	3,044	3,971	3,590	4,163	4,147	4,499	4,450	4,553	4,673
China	817	848	367	551	233	516	187	413	135	314	192	226
Other [2]	320	335	555	551	701	459	749	426	773	582	811	711
Free World	1,352	1,650	1,677	1,681	2,125	1,890	2,173	2,072	2,276	2,390	2,618	2,448
Developed West	983	1,080	1,069	1,093	1,115	1,283	1,218	1,400	1,282	1,734	1,438	1,601
Less developed countries	336	565	498	579	560	604	752	664	775	654	911	845
Unspecified [3]	33	6	110	9	450	3	203	8	220	2	270	2

	1966		1967		1968		1969		1970		1971	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Total [1]	8,841	7,913	9,652	8,537	10,634	9,410	11,655	10,327	12,800	11,732	13,806	12,479
Communist countries	5,873	5,264	6,377	5,946	7,134	6,367	7,682	6,696	8,367	7,644	9,018	8,177
Eastern Europe	4,692	4,462	5,039	5,093	5,636	5,644	6,198	6,011	6,758	6,634	7,241	7,257
China	175	143	50	57	59	37	28	29	25	22	78	76
Other [2]	1,006	659	1,288	796	1,439	686	1,456	655	1,584	988	1,699	844
Free World	2,968	2,649	3,275	2,591	3,500	3,043	3,973	3,631	4,433	4,095	4,788	4,302
Developed West	1,711	1,742	1,886	1,782	2,051	2,144	2,230	2,495	2,345	2,780	2,710	2,860
Less developed countries	886	904	963	805	948	885	1,109	1,119	1,291	1,298	1,380	1,412
Unspecified [3]	371	4	426	4	501	14	574	17	797	17	698	30

[1] Because of rounding, components may not add to the totals shown.

[2] Includes Cuba.

[3] Composed primarily of trade with the less developed countries.

TABLE 4.—SOVIET TRADE WITH SELECTED WESTERN COUNTRIES[1]

[In millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total developed West trade:												
Exports	983	1,069	1,115	1,218	1,282	1,438	1,711	1,886	2,051	2,230	2,345	2,710
Imports	1,080	1,093	1,283	1,400	1,734	1,601	1,742	1,782	2,144	2,495	2,780	2,860
Turnover	2,063	2,162	2,398	2,618	3,017	3,039	3,453	3,667	4,195	4,725	5,125	5,570
United Kingdom:												
Exports	192	227	213	215	239	291	330	303	367	427	465	452
Imports	108	128	117	130	103	152	169	197	273	240	248	222
Turnover	301	355	330	345	342	443	499	501	640	667	713	674
West Germany:												
Exports	119	119	136	133	127	146	189	196	215	229	257	292
Imports	199	179	208	151	202	136	144	177	242	350	375	484
Turnover	318	298	344	284	329	282	333	372	457	579	632	776
France:												
Exports	74	79	85	104	106	111	130	145	137	141	140	216
Imports	130	120	154	71	69	114	160	188	294	323	319	313
Turnover	204	200	240	175	175	225	290	333	432	464	459	529
Italy:												
Exports	103	130	131	137	134	148	155	233	232	232	212	259
Imports	90	96	99	136	98	102	95	154	208	317	313	291
Turnover	193	226	230	273	233	250	251	387	441	548	524	550
Japan:												
Exports	76	113	113	128	165	185	239	353	391	357	379	419
Imports	62	67	146	165	193	177	224	166	185	264	345	396
Turnover	138	180	259	293	358	362	463	519	576	621	725	815
United States:												
Exports	25	24	17	25	21	34	47	39	43	61	64	60
Imports	60	51	27	28	163	65	63	63	57	117	115	144
Turnover	85	75	44	53	184	99	110	102	99	177	179	204

[1] Because of rounding, components may not add to the totals shown.

TABLE 5.—SOVIET EXPORTS TO THE DEVELOPED WEST

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total exports	$983	$1,069	$1,115	$1,218	$1,282	$1,438	$1,711	$1,886	$2,051	$2,230	$2,345	$2,710
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Fuels, lubricants, and related materials	$253	$287	$326	$389	$401	$390	$466	$549	$609	$596	$675	$938
Percent	25.738	26.848	29.238	31.938	31.279	27.121	27.236	29.109	29.693	26.726	28.785	34.613
Coal and coke	$57	$66	$77	$98	$109	$100	$100	$103	$101	$115	$131	$158
Percent	5.799	6.174	6.906	8.046	8.502	6.954	5.845	5.461	4.924	5.157	5.586	5.830
Petroleum and petroleum products	$196	$221	$249	$291	$292	$290	$366	$446	$506	$469	$528	$757
Percent	19.939	20.674	22.332	23.892	22.777	20.167	21.391	23.648	24.671	21.031	22.516	27.934
Ores and concentrates	$33	$31	$25	$26	$28	$37	$47	$49	$52	$55	$66	$69
Percent	3.357	2.900	2.242	2.135	2.184	2.573	2.747	2.598	2.535	2.466	2.814	2.546
Base metals and manufactures	$112	$122	$120	$117	$190	$203	$247	$205	$209	$168	$213	$253
Percent	11.394	11.413	10.762	9.606	14.821	14.117	14.436	10.870	10.190	7.534	9.083	9.336
Ferrous metals	$72	$82	$85	$84	$115	$120	$125	$111	$92	$101	$123	$120
Percent	7.325	7.671	7.623	6.897	8.970	8.345	7.306	5.885	4.486	4.529	5.245	4.428
Pig iron	$68	$41	$46	$42	$48	$51	$61	$55	$40	$27	$28	$25
Percent	6.918	3.835	4.126	3.448	3.744	3.547	3.565	2.916	1.950	1.211	1.194	.923
Rolled ferrous metals	$21	$25	$26	$29	$38	$30	$25	$22	$23	$31	$35	$30
Percent	2.136	2.339	2.332	2.381	2.964	2.086	1.461	1.166	1.121	1.390	1.493	1.107
Nonferrous metals	$40	$40	$35	$33	$75	$83	$122	$94	$117	$67	$90	$133
Percent	4.069	3.742	3.139	2.709	5.850	5.772	7.130	4.984	5.705	3.004	3.838	4.908
Aluminum	$7	$7	$15	$15	$26	$30	$40	$33	$32	$44	$42	$39
Percent	.712	.655	1.345	1.232	2.028	2.086	2.338	1.750	1.560	1.973	1.791	1.439
Wood and wood products	$158	$178	$202	$211	$273	$297	$298	$322	$338	$348	$384	$380
Percent	16.073	16.651	18.117	17.323	21.295	20.654	17.417	17.073	16.480	15.605	16.375	14.022
Lumber	$100	$107	$110	$125	$159	$165	$155	$141	$138	$145	$140	$137
Percent	10.173	10.009	9.865	10.263	12.402	11.474	9.059	7.476	6.728	6.502	5.970	5.055
Textile raw materials and semimanufactures	$70	$52	$53	$48	$46	$75	$102	$126	$113	$87	$49	$98
Percent	7.121	4.864	4.753	3.941	3.588	5.216	5.961	6.681	5.510	3.901	2.090	3.616
Cotton	$50	$35	$32	$30	$31	$59	$80	$108	$102	$77	$37	$88
Percent	5.086	3.274	2.870	2.463	2.418	4.103	4.676	5.726	4.973	3.453	1.578	3.247

TABLE 5.—SOVIET EXPORTS TO THE DEVELOPED WEST—Continued

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Consumer goods	$167	$206	$187	$218	$144	$167	$202	$240	$234	$279	$203	$266
Percent	16.989	19.270	16.771	17.898	11.232	11.613	11.806	12.725	11.409	12.511	8.657	9.815
Food	$116	$158	$133	$140	$70	$90	$113	$146	$143	$200	$116	$174
Percent	11.801	14.780	11.928	11.494	5.460	6.259	6.604	7.741	6.972	8.969	4.947	6.421
Grain	$85	$128	$94	$70	$16	$20	$3	$32	$37	$69	$23	$46
Percent	8.647	11.974	8.430	5.747	1.248	1.391	.175	1.697	1.804	3.094	981	1.697
Manufactured consumer goods	$51	$48	$54	$78	$74	$77	$89	$94	$91	$79	$87	$92
Percent	5.188	4.490	4.843	6.404	5.772	5.355	5.202	4.984	4.437	3.543	3.710	3.395
Furs and pelts	$44	$41	$46	$67	$56	$54	$63	$55	$54	$49	$46	$48
Percent	4.476	3.835	4.126	5.501	4.368	3.755	3.682	2.916	2.633	2.197	1.962	1.771
Unspecified [1]	$40	$62	$75	$99	$105	$144	$183	$195	$285	$503	$538	$482
Percent	4.069	5.800	6.726	8.128	8.190	10.014	10.695	10.339	13.896	22.556	22.942	17.786

[1]Largely platinum group metals, nickel, and gem diamonds.

Note: Total U.S. dollar amount, $53,422,000,000.

TABLE 6.—SOVIET IMPORTS FROM THE DEVELOPED WEST

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total imports	$1,080	[1] $1,067	$1,283	$1,400	$1,734	$1,601	$1,742	$1,782	$2,495	$1,495	$2,780	$2,860
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Machine and equipment	$456	$470	$602	$589	$621	$510	$560	$670	$896	$1,118	$1,115	$1,042
Percent	42.222	44.049	46.921	42.071	35.813	31.855	32.147	37.598	41.791	44.810	40.108	36.434
Chemical equipment	$135	$182	$88	$124	$113	$111	$147	$177	$204	$155	$93	$151
Percent	12.500	12.371	6.859	8.857	6.517	6.933	8.439	9.933	9.515	6.212	3.345	5.280
Transport equipment	$121	$68	$150	$163	$257	$196	$194	$131	$137	$162	$337	$386
Percent	11.204	6.373	11.691	11.643	14.821	12.242	11.137	7.351	6.390	6.493	12.122	13.497
Base metals and manufacturers	$291	$249	$287	$188	$74	$115	$92	$132	$157	$178	$196	$136
Percent	26.944	23.336	22.369	13.429	4.268	7.183	5.281	7.407	7.323	7.134	7.050	4.755
Ferrous metals	$240	$194	$234	$137	$64	$105	$81	$112	$124	$159	$303	$365
Percent	22.222	18.182	18.239	9.786	3.691	6.558	4.650	6.285	5.784	6.373	10.899	12.762
Rolled ferrous metals	$225	$178	$221	$126	$61	$97	$71	$100	$116	$151	$297	$358
Percent	20.833	16.682	17.225	9.000	3.518	6.059	4.076	5.612	5.410	6.052	10.683	12.517
Pipes	$102	$81	$120	$49	$30	$71	$50	$37	$44	$49	$169	$219
Percent	9.444	7.591	9.353	3.500	1.730	4.435	2.870	2.076	2.052	1.964	6.079	7.657
Nonferrous metals	$51	$55	$53	$51	$10	$10	$11	$20	$33	$19	$34	$21
Percent	4.722	5.155	4.131	3.643	.577	.625	.631	1.122	1.539	.762	1.223	.734
Wood and wood products	$51	$70	$65	$67	$79	$100	$104	$134	$136	$151	$178	$189
Percent	4.722	6.560	5.066	4.786	4.556	6.246	5.970	7.520	6.343	6.052	6.403	6.608
Chemicals	$43	$36	$57	$87	$103	$140	$143	$167	$195	$217	$221	$213
Percent	3.981	3.374	4.443	6.214	5.940	8.745	8.209	9.371	9.095	8.697	7.950	7.448
Textile raw materials and semi-manufactures	$81	$85	$78	$88	$76	$89	$103	$125	$138	$176	$183	$162
Percent	7.500	7.966	6.080	6.286	4.383	5.559	5.913	7.015	6.437	7.054	6.583	5.664
Wool fiber	$48	$37	$30	$42	$40	$38	$47	$34	$50	$65	$60	$50
Percent	4.444	3.468	2.338	3.000	2.307	2.374	2.698	1.908	2.332	2.605	2.158	1.748
Staple fiber, artificial, synthetic	$14	$32	$31	$32	$26	$30	$25	$29	$23	$27	$35	$31
Percent	1.296	2.999	2.416	2.286	1.499	1.874	1.435	1.627	1.073	1.082	1.259	1.084
Consumer goods	$53	$79	$73	$245	$642	$488	$571	$400	$425	$345	$505	$557
Percent	4.907	7.404	5.690	17.500	37.024	30.481	32.778	22.447	19.823	13.828	18.165	19.476
Wheat and wheat flour		$31		$189	$544	$367	$414	$146	$121	$28	$122	$170
Percent		2.905		13.500	31.373	22.923	23.766	8.193	5.644	1.122	4.388	5.944
Manufactured consumer goods	$22	$23	$22	$23	$30	$63	$116	$219	$272	$275	$296	$285
Percent	2.037	2.156	1.715	1.643	1.730	3.935	6.659	12.290	12.687	11.022	10.647	9.965
Unspecified	$29	NA	$28	$35	$46	$33	$43	$40	$92	$173	$125	$175
Percent	2.685	NA	2.182	2.500	2.653	2.061	2.468	2.245	4.291	6.934	4.496	6.119

[1] Total has been updated to 1,093, but components have not yet been updated.

TABLE 7.—IMPACT OF DEFICIT FINANCING ON SOVIET GOLD RESERVES

[Dollar amounts in millions of U.S. dollars]

	Hard currency			Gold sales [1]		Gold reserves [1]	
	Exports	Imports	Balance	Amount	Tons	Amount	Tons
1960	$768	$1,018	−$250	$200	180	$2,555	2,270
1961	900	1,061	−161	300	270	2,365	2,100
1962	951	1,184	−233	215	195	2,250	2,000
1963	1,012	1,287	−275	550	500	1,800	1,600
1964	1,073	1,556	−483	450	410	1,495	1,330
1965	1,374	1,560	−186	550	500	1,095	975
1966	1,517	1,755	−238	(2)	(2)	1,265	1,125
1967	1,711	1,616	+95	15	14	1,425	1,265
1968	1,909	2,018	−109	12	11	1,590	1,415
1969	2,125	2,436	−311	(2)	(2)	1,765	1,570
1970	2,197	2,711	−514	(2)	(2)	1,945	1,730
1971	2,652	2,955	−303	(2)	(2)	2,135	1,895
1972 [3]	2,900	4,000	+1,100	250–300	150	(4)	1,950

[1] Calculated at the official rate of $35 an ounce for sales in 1960–68 and for reserves 1960–71, Reserves are end of year. All gold figures are based on Bank for International Settlements figures cited in "Gold 1971", David Floyd-Jacob and Peter Fells, Walker and Co., New York, 1972, except reserves for 1960–63, which are estimated from assumed net production of 100 tons per year.

[2] Negligible.

[3] Preliminary estimates.

[4] Valued at about $2,400,000,000 at the then official price of $38 an ounce, but worth considerably more at current free market prices.

TABLE 8.—ESTIMATED SOVIET DRAWINGS AND SCHEDULED REPAYMENTS ON WESTERN GOVERNMENT GUARANTEED MEDIUM-TERM AND LONG-TERM CREDITS

[In millions of U.S. dollars]

	Drawings [1]	Scheduled repayments [2]	Interest [2]	Net credits	Debt outstanding at end of year
1959	60	12	0	48	48
1960	125	37	2	86	136
1961	165	70	6	89	231
1962	180	106	10	64	305
1963	140	130	14	−4	315
1964	170	147	15	8	338
1965	190	149	17	24	379
1966	275	149	20	106	505
1967	305	152	29	124	658
1968	510	215	38	257	953
1969	630	270	57	303	1,313
1970	700	319	79	302	1,694
1971	700	387	96	217	2,007
1972 [3]	900	457	106	337	2,450

[1] Estimates of drawings are based on reports of Soviet purchases of Western machinery and equipment on credit, on official Soviet statistics, of Soviet imports of machinery and equipment, and on Soviet and Western press reports.

[2] Repayments and interest are calculated on the length of credits reported and on the average interest rate reported or in effect in Western markets at the time. Typical terms since 1965 have averaged 8 years for repayment after delivery and 6-percent interest, although there have been a number of variations around this average.

[3] Preliminary.

TABLE 9.—ESTIMATED SOVIET HARD CURRENCY BALANCE OF PAYMENTS

[In millions of U.S. dollars]

	1960		1961		1962		1963		1964		1965		1966	
	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit
Goods and services		292		252		286		318		529		211		270
Merchandise, f.o.b.[1]	768	1,018	900	1,061	951	1,184	1,012	1,287	1,073	1,556	1,374	1,560	1,517	1,755
Transportation, net		65		115		75		60		60		45		50
Travel	25	(2)	30	(2)	32	(2)	31	(2)	37	8	46	9	50	12
Interest payments [3]		2		6		10		14		15		17		20
Transfer payments [4]		15		16		18		23		24		27		30
Capital and monetary gold	277		384		278		549		462		580		115	
Medium- and long-term credits	125	37	165	70	180	106	140	130	170	147	190	149	275	149
Compensation payments [5]		11		11		11		11		11		11		11
Monetary gold	200		300		215		550		450		550		(6)	
Net errors and omissions	30			116	26			208	91			342	185	

	1967		1968		1969		1970		1971		1972 [8]	
	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit
Goods and services	89		124		302		496		274			706
Merchandise, f.o.b.[1]	1,711	1,616	1,909	2,018	2,125	2,436	2,197	2,711	2,652	2,955	2,900	3,500
Transportation, net		20		15	10		35		50		(2)	
Travel	55	12	52	14	71	15	81	19	96	21	(2)	(7)
Interest payments [3]		29		38		57		79		96		106
Transfer payments [4]		32		35		38		40		43		45
Capital and monetary gold	157		296		349		370		302		731	
Medium- and long-term credits	305	152	510	215	630	270	700	319	700	387	900	457
Compensation payments [5]		11		11		11		11		11		12
Monetary gold	15		12		(6)		(6)		(6)		(250–300)	
Net errors and omissions [7]		214		137		9	166		15		20	

[1] Derived from official Soviet statistics, [U.S.S.R. Ministeratvo Vneshnei Torgove. "Vneshniaia torgovlia S.S.S.R. za 1967 (–1971) goe."].

[2] Not available.

[3] Interest payments are those made on medium- and long-term credits from Western countries mainly to finance imports of machinery and equipment. Interest payments and receipts for short-term loans are not included.

[4] Payments made in hard currency to the United Nations and U.N.-affiliated organizations.

[5] Soviet payments of principal and interest in accordance with the U.S. lend-lease "pipeline" agreement. Payments are based on an annual average of total given as paid at the time of U.S.-Soviet settlement of lend-lease differences in 1972.

[6] Negligible.

[7] Including changes in hard currency holdings and short-term capital movements.

[8] Preliminary estimates.

COMMODITY BREAKOUT OF SOVIET FOREIGN TRADE 1960-1971

TABLE 10.—SOVIET EXPORTS TO THE WORLD

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total exports	$5,564	$5,998	$7,031	$7,272	$7,683	$8,175	$8,841	$9,652	$10,634	$11,655	$12,800	$13,806
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Machinery and equipment	$1,143	$966	$1,169	$1,435	$1,613	$1,636	$1,838	$2,036	$2,302	$2,623	$2,756	$3,005
Percent	20.543	16.089	16.626	19.733	20.994	20.012	20.790	21.094	21.648	22.505	21.531	21.766
Complete plants	$571	$356	$411	$555	$604	$614	$641	$721	$819	$961	$955	(1)
Percent	10.262	5.935	5.846	7.632	7.862	7.511	7.250	7.470	7.702	8.245	0.898	0.688
Fuels, lubricants and related materials	$902	$1,045	$1,151	$1,288	$1,364	$1,386	$1,428	$1,523	$1,675	$1,776	$1,987	$2,468
Percent	16.211	17.422	16.370	17.712	17.753	16.954	16.152	15.841	15.751	15.238	15.523	17.876
Coal and coke	$242	$285	$346	$376	$419	$384	$358	$352	$341	$368	$408	$489
Percent	4.349	4.752	4.921	5.171	5.454	4.697	4.049	3.647	3.207	3.157	3.188	3.542
Petroleum and petroleum products	$658	$758	$803	$910	$943	$999	$1,064	$1,156	$1,306	$1,367	$1,470	$1,831
Percent	11.826	12.638	11.421	12.514	12.274	12.220	12.035	11.977	12.281	11.729	11.484	13.262
Ores and concentrates	$243	$253	$274	$291	$314	$310	$302	$326	$358	$367	$403	$419
Percent	4.367	4.218	3.897	4.002	4.087	3.752	3.416	3.378	3.367	3.149	3.148	3.035
Iron ore	$175	$188	$216	$236	$256	$251	$242	$262	$290	$295	$325	$335
Percent	3.145	3.134	3.072	3.245	3.332	3.070	2.737	2.714	2.727	2.531	2.539	2.426
Base metals and manufactures	$871	$923	$1,010	$1,012	$1,255	$1,330	$1,345	$1,340	$1,451	$1,746	$1,980	$2,063
Percent	15.654	15.388	14.365	13.916	16.335	16.269	15.213	13.883	13.645	14.981	15.469	14.943
Ferrous metals	$676	$712	$792	$793	$963	$998	$965	$975	$1,013	$1,178	$1,352	$1,364
Percent	12.150	11.871	11.264	10.905	12.534	12.208	10.915	10.102	9.526	10.107	10.563	9.880

Rolled ferrous metals	$480	$536	$602	$605	$713	$716	$692	$703	$723	$847	$962	$953
Percent	8.627	8.936	8.562	8.320	9.280	8.758	7.827	7.283	6.799	7.267	7.516	6.903
Nonferrous metals	$195	$211	$218	$219	$292	$332	$380	$365	$438	$568	$628	$699
Percent	3.505	3.518	3.101	3.012	3.801	4.061	4.298	3.782	4.119	4.873	4.906	5.063
Aluminum	$35	$45	$58	$60	$88	$111	$119	$121	$138	$159	$184	$199
Percent	0.629	0.750	0.825	0.825	1.145	1.358	1.346	1.254	1.298	1.364	1.438	1.441
Chemicals	$151	$180	$178	$192	$202	$245	$277	$329	$363	$378	$363	$396
Percent	2.714	3.001	2.532	2.640	2.629	2.997	3.133	3.409	3.414	3.243	2.836	2.868
Wood and wood products	$305	$362	$420	$414	$506	$594	$622	$626	$683	$724	$832	$865
Percent	5.482	6.035	5.974	5.693	6.586	7.266	7.035	6.486	6.423	6.212	6.500	6.265
Lumber	$183	$207	$221	$235	$282	$312	$308	$283	$292	$307	$333	$353
Percent	3.289	3.451	3.143	3.232	3.670	3.817	3.484	2.932	2.746	2.634	2.602	2.557
Textile raw materials and semimanufactures	$359	$365	$341	$338	$382	$421	$460	$451	$479	$403	$437	$455
Percent	6.452	6.085	4.850	4.648	4.972	5.150	5.203	4.673	4.504	3.458	3.414	3.296
Cotton	$289	$284	$260	$244	$297	$335	$368	$373	$404	$324	$372	$400
Percent	5.194	4.735	3.698	3.355	3.866	4.098	4.162	3.864	3.799	2.780	2.906	2.897
Consumer goods	$907	$1,011	$1,124	$1,164	$812	$901	$1,048	$1,375	$1,334	$1,480	$1,353	$1,593
Percent	16.301	16.856	15.896	16.007	10.569	11.021	11.854	14.246	12.545	12.698	10.570	11.538
Food	$702	$797	$906	$917	$573	$663	$787	$1,086	$1,032	$1,176	$1,018	$1,244
Percent	12.617	13.288	12.886	12.610	7.458	8.110	8.902	11.252	9.705	10.090	7.953	9.011
Grain	$468	$474	$529	$424	$242	$270	$232	$450	$383	$498	$399	$602
Percent	8.411	7.903	7.524	5.831	3.150	3.303	2.624	4.662	3.602	4.273	3.117	4.360
Manufactured consumer goods	$205	$214	$218	$247	$239	$238	$261	$289	$302	$304	$338	$353
Percent	3.684	3.568	3.101	3.397	3.111	2.911	2.952	2.994	2.840	2.608	2.641	2.557
Unspecified	$477	$678	$1,143	$923	$1,026	$1,108	$1,210	$1,276	$1,596	$1,760	$2,221	$2,100
Percent	8.573	11.304	16.257	12.693	13.354	13.554	13.686	13.220	15.008	15.101	17.352	15.211

[1] From 1970 edition. [2] Not available.

TABLE 11.—SOVIET IMPORTS FROM THE WORLD

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	197
Total imports	$5,628	$5,828	$6,455	$7,059	$7,737	$8,058	$7,913	$8,537	$9,410	$10.327	$11,732	$12,479
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Machinery and equipment	$1,675	$1,734	$2,245	$2,466	$2,665	$2,692	$2,565	$2,917	$3,475	$3,873	$4,170	$4,240
Percent	29.762	29.753	34.779	34.934	34.445	33.408	32.415	34.169	36.929	37.504	35.544	33.977
Transport	$660	$534	$749	$848	$997	$990	$944	$928	$1,049	$1,119	$619	$702
Equipment	11.727	9.163	11.603	12.013	12.886	12.286	11.930	10.870	11.148	10.836	5.276	5.625
Fuels, lubricants and related materials	$237	$216	$198	$201	$183	$198	$185	$188	$178	$203	$228	$326
Percent	4.211	3.706	3.067	2.847	2.365	2.457	2.338	2.202	1.892	1.966	1.943	2.612
Coal and coke	$94	$93	$95	$97	$97	$123	$128	$135	$122	$127	$124	$149
Percent	1.670	1.596	1.472	1.374	1.254	1.526	1.618	1.581	1.296	1.230	1.057	1.194
Petroleum and petroleum products	$143	$123	$103	$104	$86	$75	$57	$52	$47	$64	$82	$123
Percent	2.541	2.111	1.596	1.473	1.112	0.931	0.720	0.609	0.499	0.620	0.699	0.986
Ores and concentrates	$314	$291	$298	$292	$302	$316	$300	$314	$189	$224	$303	$336
Percent	1.579	4.993	4.617	4.137	3.903	3.922	3.791	3.678	2.009	2.169	2.583	2.693
Base metals and manufactures	$546	$494	$563	$465	$357	$389	$307	$355	$453	$555	$691	$751
Percent	9.701	8.476	8.722	6.587	4.614	4.828	3.880	4.158	4.814	5.374	5.890	6.018
Ferrous metals	$374	$348	$427	$340	$277	$314	$249	$295	376	$476	$593	$662
Percent	6.645	5.971	6.615	4.817	3.580	3.897	3.147	3.456	3.996	4.609	5.055	5.305
Rolled ferrous metals	$338	$317	$402	$306	$252	$287	$224	$263	$357	$451	$568	$633
Percent	6.006	5.439	6.228	4.335	3.257	3.562	2.831	3.081	3.794	4.367	4.841	5.073
Pipe	$159	$156	$209	$137	$115	$155	$125	$118	$154	$198	$279	$317
Percent	2.825	2.677	3.238	1.941	1.486	1.924	1.580	1.382	1.637	1.917	2.378	2.540

Nonferrous metals	$172	$146	$136	$125	$80	$75	$58	$60	$77	$79	$98	$83
Percent	3.056	2.505	2.107	1.771	1.034	0.931	0.733	0.703	0.818	0.765	0.835	0.719
Copper	$72	$53	$69	$57	$7	----------	$8	$1	$11	----------	$1	$8
Percent	1.279	0.909	1.069	0.807	0.090	----------	0.101	0.012	0.117	----------	0.009	0.064
Tin	$35	$22	$20	$17	$18	$21	$16	$18	$22	$23	$30	$14
Percent	0.622	0.337	0.310	0.241	0.233	0.261	0.202	0.211	0.234	0.223	0.256	0.112
Chemicals	$150	$154	$214	$288	$353	$375	$400	$468	$535	$592	$619	$702
Percent	2.665	2.642	3.315	4.080	4.562	4.654	5.055	5.482	5.685	5.733	5.276	5.625
Rubber and rubber products	$196	$273	$251	$212	$145	$199	$207	$183	$172	$193	$192	$154
Percent	3.483	4.684	3.888	3.003	1.874	2.470	2.616	2.144	1.828	1,869	1,637	1.234
Wood and wood products	$105	$124	$118	$119	$131	$150	$152	$187	$195	$219	$249	$259
Percent	1.866	2.128	1.828	1.686	1.693	1.862	1.921	2.190	2.072	2.121	2.122	2.075
Textile raw material and semi-manufactures	$364	$303	$283	$339	$293	$358	$375	$343	$368	$441	$561	$563
Percent	6.468	5.199	4.384	4.802	3.787	4.443	4.739	4.018	3.911	4.270	4.782	4.512
Cotton fiber	$180	$130	$119	$170	$118	$162	$140	$113	$119	$149	$250	$253
Percent	3.198	2.231	1.844	2.408	1.525	2.010	1.769	1.324	1.265	1.443	2.131	2.027
Wool fiber	$118	$104	$93	$89	$98	$100	$118	$89	$109	$118	$120	$113
Percent	2.097	1.784	1.441	1.261	1.267	1.241	1.491	1.043	1.158	1.143	1.023	0.906
Consumer goods	$1,571	$1,776	$1,813	$2,106	$2,637	$2,657	$2,725	$2,868	$2,962	$3,077	$3,758	$4,109
Percent	27.914	30.474	28.087	29.834	34.083	32.973	34.437	33.595	31.477	29.796	32.032	32.927
Food	$611	$783	$708	$869	$1,482	$1,512	$1,444	$1,244	$1,166	$1,185	$1,563	$1,562
Percent	10.856	13.435	10.968	12.311	19.155	18.764	18.248	14.572	12.391	11.475	13.323	12.517
Wheat and wheat flour	$7	$45	$3	$213	$493	$398	$482	$129	$96	$3	$116	$149
Percent	0.124	0.772	0.046	3.017	6.372	4.939	6.091	1.511	1.020	0.029	0.989	1.194
Manufactured consumer goods	$960	$993	$1,105	$1,237	$1,155	$1,145	$1,281	$1,624	$1,796	$1,892	$2,201	$2,555
Percent	17.058	17.038	17.119	17.524	14.928	14.209	16.189	19.023	19.086	18.321	18.761	20.474
Unspecified	$90	$118	$108	$156	$211	$243	$220	$225	$415	$452	$538	$565
Percent	1.599	2.025	1.673	2.210	2.727	3.016	2.780	2.636	4.410	4.377	4.586	4.528

TABLE 12.—SOVIET EXPORTS TO THE EAST EUROPEAN COMMUNIST COUNTRIES

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total exports	$3,074	$3,400	$3,971	$4,163	$4,499	$4,553	$4,692	$5,039	$5,636	$6,198	$6,758	$7,241
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Machinery and equipment	$389	$450	$607	$735	$787	$787	$960	$1,100	$1,230	$1,340	$1,408	$1,648
Percent	12.655	13.235	15.286	17.656	17.493	17.285	20.460	21.830	21.824	21.620	20.835	22.759
Complete plants	$96	$108	$142	$184	$179	$213	$246	$276	$301	$304	[1] $270	(2)
Percent	3.123	3.176	3.576	4.420	3.979	4.678	5.243	5.477	5.341	4.905	3.995	(2)
Fuels, lubricants and related materials	$412	$486	$583	$654	$726	$737	$715	$737	$795	$899	$1,016	$1,167
Percent	13.403	14.294	14.681	15.710	16.137	16.187	15.239	14.626	14.106	14.505	15.034	16.117
Coal and coke	$171	$204	$252	$265	$289	$265	$243	$227	$204	$218	$241	$282
Percent	5.563	6.000	6.346	6.366	6.424	5.820	5.179	4.505	3.620	3.517	3.566	3.894
Petroleum and petroleum products	$239	$280	$329	$387	$435	$469	$466	$490	$566	$651	$685	$768
Percent	7.775	8.235	8.285	9.296	9.669	10.301	9.932	9.724	10.043	10.503	10.136	10.606
Ores and concentrates	$207	$218	$246	$264	$285	$271	$254	$273	$297	$303	$330	$343
Percent	6.734	6.412	6.195	6.342	6.335	5.952	5.413	5.418	5.270	4.889	4.883	4.737
Iron ore	$171	$184	$211	$230	$250	$243	$231	$249	$274	$277	$303	$312
Percent	5.563	5.412	5.314	5.525	5.557	5.337	4.923	4.941	4.862	4.469	4.484	4.309
Base metals and manufactures	$579	$652	$727	$755	$908	$928	$917	$952	$1,042	$1,171	$1,302	$1,344
Percent	18.835	19.176	18.308	18.136	20.182	20.382	19.544	18.893	18.488	18.893	19.266	18.561
Ferrous metals	$447	$506	$574	$599	$721	$718	$700	$723	$766	$910	$1,002	$1,000
Percent	14.541	14.882	14.455	14.389	16.026	15.770	14.919	14.348	13.591	14.682	14.827	13.810
Rolled ferrous metals	$357	$414	$469	$484	$575	$564	$557	$572	$582	$687	$752	$756

Percent	11.614	12.176	11.811	11.626	12.781	12.387	11.871	11.351	10.326	11.084	11.128	10.441
Nonferrous metals	$132	$146	$153	$156	$187	$210	$217	$229	$276	$261	$300	$344
Percent	4.294	4.294	3.853	3.747	4.156	4.612	4.625	4.545	4.897	4.211	4.439	4.751
Aluminum	$26	$35	$37	$43	$56	$72	$66	$75	$97	$102	$125	$149
Percent	0.846	1.029	0.932	1.033	1.245	1.581	1.407	1.488	1.721	1.646	1.850	2.058
Chemicals	$64	$75	$83	$92	$111	$124	$134	$143	$179	$213	$211	$227
Percent	2.082	2.206	2.090	2.210	2.467	2.723	2.856	2.838	3.176	3.437	3.122	3.135
Wood and wood products	$100	$118	$148	$139	$163	$186	$200	$220	$254	$280	$321	$347
Percent	3.253	3.471	3.727	3.339	3.623	4.085	4.263	4.366	4.507	4.518	4.750	4.792
Lumber	$59	$69	$82	$83	$91	$101	$100	$102	$113	$113	$127	$138
Per cent	1.919	2.029	2.065	1.994	2.023	2.218	2.131	2.024	2.005	1.823	1.879	1.906
Textile raw materials and semimanufactures	$283	$293	$273	$274	$318	$322	$332	$290	$306	$265	$340	$308
Percent	9.206	8.618	6.875	6.582	7.068	7.072	7.076	5.755	5.429	4.276	5.031	4.254
Cotton	$233	$231	$215	$201	$250	$255	$266	$235	$258	$216	$298	$273
Percent	7.580	6.794	5.414	4.828	5.557	5.601	5.669	4.664	4.578	3.485	4.410	3.770
Consumer goods	$562	$513	$639	$610	$392	$422	$462	$587	$592	$580	$548	$657
Percent	18.282	15.088	16.092	14.653	8.713	9.269	9.847	11.649	10.504	9.358	8.109	9.073
Food	$490	$430	$549	$524	$324	$353	$389	$501	$489	$469	$432	$543
Percent	15.940	12.647	13.825	12.587	7.202	7.753	8.291	9.942	8.676	7.567	6.392	7.499
Grain	$345	$275	$347	$297	$193	$200	$188	$271	$277	$322	$305	$431
Percent	11.223	8.088	8.738	7.134	4.290	4.393	4.007	5.378	4.915	5.195	4.513	5.952
Manufactured consumer goods	$72	$83	$90	$86	$68	$69	$73	$88	$103	$111	$116	$114
Percent	2.342	2.441	2.266	2.066	1.511	1.515	1.556	1.707	1.828	1.791	1.716	1.574
Unspecified	$382	$483	$548	$523	$682	$645	$562	$563	$759	$948	$1,031	$967
Percent	12.427	14.206	13.800	12.563	15.159	14.166	11.978	11.173	13.467	15.295	15.256	13.355

[1] From 1970 edition. [2] Not available.

TABLE 13.—SOVIET IMPORTS FROM THE EAST EUROPEAN COMMUNIST COUNTRIES

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total imports	$2,795	$3,044	$3,590	$4,147	$4,450	$4,673	$4,462	$5,093	$5,644	$6,011	$6,634	$7,257
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Of which:												
Machinery and equipment	$1,209	$1,245	$1,624	$1,859	$2,025	$2,114	$1,926	$2,165	$2,509	$2,679	$2,953	$3,109
Percent	43.256	40.900	45.237	44.828	45.506	45.239	43.165	42.902	44.454	44.568	44.513	42.841
Transport equipment	$533	$451	$579	$669	$726	$729	$678	$757	$848	$909	$970	$904
Percent	19.070	14.816	16.128	16.132	16.315	15.600	15.195	14.864	15.025	15.122	14.622	12.457
Fuels, lubricants and related materials	$208	$192	$183	$181	$176	$189	$175	$177	$160	$165	$145	$174
Percent	7.442	6.307	5.097	4.365	3.955	4.045	3.922	3.475	2.835	2.745	2.186	2.398
Coal and coke	$91	$91	$92	$93	$94	$119	$127	$135	$122	$127	$124	$149
Percent	3.256	2.989	2.563	2.243	2.112	2.547	2.846	2.651	2.162	2.113	1.869	2.053
Petroleum and petroleum products	$117	$101	$91	$88	$82	$70	$48	$42	$38	$38	$21	$25
Percent	4.186	3.318	2.535	2.122	1.843	1.498	1.076	0.825	0.673	0.632	0.317	0.344
Ores and concentrates [1]	$102	$92	$161	$178	$94	$145	$121	$114	$125	$142	$159	$160
Percent	3.649	3.022	4.485	4.292	2.112	3.103	2.712	2.238	2.215	2.362	2.397	2.205
Base metals and manufactures [1]	$95	$128	$145	$153	$171	$129	$96	$98	$118	$139	$150	$131
Percent	3.399	4.205	4.039	3.689	3.843	2.761	2.152	1.924	2.091	2.312	2.261	1.805
Ferrous metals [1]	$80	$111	$133	$139	$149	$107	$89	$90	$107	$127	$135	$115
Percent	2.862	3.647	3.705	3.352	3.348	2.290	1.995	1.767	1.896	2.113	2.035	1.585
Rolled ferrous metals [1]	$80	$110	$132	$138	$148	$97	$81	$78	$106	$126	$134	$114
Percent	2.862	3.614	3.677	3.328	3.326	2.076	1.815	1.532	1.878	2.096	2.020	1.571
Nonferrous metals [1]	$15	$17	$12	$14	$22	$22	$7	$8	$11	$12	$15	$16
Percent	0.537	0.558	0.334	0.338	0.494	0.471	0.157	0.157	0.195	0.200	0.226	0.220
Wood, and wood products	$44	$49	$48	$45	$42	$39	$37	$42	$45	$44	$43	$45
Percent	1.574	1.610	1.337	1.085	0.944	0.835	0.829	0.825	0.797	0.732	0.648	0.620
Chemicals	$74	$96	$134	$171	$207	$198	$212	$257	$292	$326	$349	$422
Percent	2.648	3.154	3.733	4.123	4.652	4.237	4.751	5.046	5.174	5.423	5.261	5.815
Rubber and rubber products	$22	$25	$23	$25	$28	$28	$31	$42	$39	$26	$25	$26
Percent	0.787	0.821	0.641	0.603	0.629	0.599	0.695	0.825	0.691	0.433	0.377	0.358
Consumer goods	$670	$815	$907	$1,103	$1,088	$1,186	$1,276	$1,532	$1,637	$1,711	$1,947	$2,243
Percent	23.971	26.774	25.265	26.598	24.449	25.380	28.597	30.081	29.004	28.464	29.349	30.908
Food	$171	$253	$227	$262	$256	$304	$290	$351	$365	$389	$399	$457
Percent	6.118	8.311	6.323	6.318	5.753	6.505	6.499	6.892	6.467	6.471	6.014	6.297
Manufactured consumer goods	$499	$562	$680	$841	$832	$882	$986	$1,181	$1,272	$1,322	$1,549	$1,790
Percent	17.853	18.463	18.942	20.280	18.697	18.874	22.098	23.189	22.537	21.993	23.349	24.666
Unspecified	$240	$258	$221	$265	$429	$472	$425	$464	$532	$603	$750	$81
Percent	8.587	8.476	6.156	6.390	9.640	10.101	9.525	9.111	9.426	10.032	11.305	11.235

[1] Soviet imports of ores and metals from Czechoslovakia are not broken down into identifiable components. Consequently they are included in imports of ores and concentrates and excluded from the base metal and manufacture categories. Soviet imports of ores and metals from Czechoslovakia amounted to $76,000,000 (1960), $102,000,000 (1961), $102,000,000 (1962), $72,000,000 (1963), $76,000,000 (1964), $131,000,000 (1965), $10,000,000 (1966), $105,000,000 (1967), $110,000,000 (1968), $126,000,000 (1969), $140,000,000, (1970), $145,000,000 (1971).

TABLE 14.—SOVIET EXPORTS TO THE LESS DEVELOPED WORLD

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total exports	$335	$498	$560	$725	$775	$911	$886	$963	$948	$1,169	$1,292	$1,380
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Machinery and equipment	$125	$236	$286	$361	$463	$472	$426	$448	$480	$636	$684	$694
Percent	37.313	47.390	51.071	49.793	59.742	51.811	48.081	46.521	50.633	54.405	52.941	50.290
Complete plants	$69	$139	$183	$221	$297	$284	$245	$274	$293	$397	[1] $408	([2])
Percent	20.597	27.912	32.679	30.483	38.323	31.175	27.652	28.453	30.907	33.961	4.489	([2])
Transport equipment	$22	$62	$57	$72	$90	$103	$100	$104	$118	$141	$79	$109
Percent	6.567	12.450	10.179	9.931	11.613	11.306	11.287	10.800	12.447	12.062	6.115	7.899
Petroleum and petroleum products	$54	$61	$57	$74	$91	$132	$121	$94	$80	$80	$158	$223
Percent	16.119	12.249	10.179	10.207	11.742	14.490	13.657	9.761	8.439	6.843	12.229	16.159
Rolled ferrous metals	$26	$25	$33	$25	$34	$43	$46	$43	$51	$64	$87	$73
Percent	7.761	5.020	5.893	3.448	4.387	4.720	5.192	4.465	5.380	5.475	6.734	5.290
Wood and wood products	$38	$37	$34	$36	$40	$54	$62	$49	$51	$56	$69	$75
Percent	11.343	7.430	6.071	4.966	5.161	5.928	6.998	5.088	5.380	4.790	5.341	5.435
Food	$35	$47	$69	$98	$44	$64	$74	$186	$117	$138	$98	$143
Percent	10.448	9.438	12.321	13.517	5.677	7.025	8.352	19.315	12.342	11.805	7.585	10.362
Unspecified	$13	$38	$18	$69	$31	$54	$63	$43	$66	$89	$161	$168
Percent	3.881	7.631	3.214	9.517	4.000	5.928	7.111	4.465	6.962	7.613	12.461	12.174

[1] From 1970 edition.
[2] Not available.

Note: Total U.S. dollar amount, $23,574,000,000.

TABLE 15.—SOVIET IMPORTS FROM THE LESS DEVELOPED WORLD

[Dollar amounts in millions of U.S. dollars]

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total imports	$564	$579	$604	$665	$654	$845	$904	$805	$885	$1,119	$1,299	$1,410[3]
Percent	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.003
Cotton fiber	$146	$122	$112	$168	$117	$162	$140	$113	$119	$149	$250	$25
Percent	25.887	21.071	18.543	25.263	17.890	19.172	15.487	14.037	13.446	13.315	19.246	17.905
Natural rubber	$152	$225	$206	$163	$93	$137	$152	$119	$116	$142	$141	$97
Percent	26.950	38.860	34.106	24.511	14.220	16.213	16.814	14.783	13.107	12.690	10.855	6.865
Food	$111	$95	$130	$147	$216	$287	$305	$266	$323	$433	$409	$464
Percent	19.681	16.408	21.523	22.105	33.028	33.964	33.739	33.043	36.497	38.695	31.486	32.838
Nonferrous metals	$33	$20	$24	$20	$13	$12	$15	$6	$4	$9	$11	$7
Percent	5.851	3.454	3.974	3.008	1.988	1.420	1.659	.745	.452	.804	.847	.495
Unspecified	$1	$1	$1	$2	$8	$4	$5	$7	$8	$13	$6	$27
Percent	.177	.173	.166	.301	1.223	.473	.553	.870	.904	1.162	.462	1.911

U.S.S.R.—WESTERN INDUSTRIAL COOPERATION

By KENNETH YALOWITZ

CONTENTS

I. INTRODUCTION

The U.S.S.R. in recent years has encouraged the conclusion of industrial cooperation agreements with Western countries and firms as a primary means of promoting the larger goal of increased trade and technological exchange. A variety of undertakings is included in the Soviet connotation of the term ranging from scientific and technical exchange agreements to barter-type industrial and natural resource development ventures.[1] Despite the relatively small-scale of U.S.S.R. trade with the industrial Western countries ($5.6 billion turnover in 1971), industrial cooperation could prove the catalyst for a qualitatively significant decree of technological and industrial interdependence.

The U.S.S.R.'s interest in increased economic and scientific interchange with Western countries stems from a combination of political and economic considerations. East-West trade is a building block in the U.S.S.R.'s strategy of peaceful coexistence and probably is viewed as another reinforcement for the political and territorial status-quo in Europe. The economic incentives for increased cooperation may be even more compelling for the U.S.S.R. Foremost are the twin needs to obtain advanced Western equipment and technology while limiting hard currency expenditures, and to increase exports to convertible currency markets.

Faced with declining economic growth rates over the past decade and difficulties in developing and emplacing advanced technology in other than the military-space sector, the U.S.S.R. is now looking to the West for the means to modernize key economic sectors, including automotives, chemicals and petro-chemicals, mining and metallurgy, agricultural equipment, computers, and telecommunications. Of particular interest is the specialized Western, especially U.S., equipment and technology suitable for the development of Siberian natural resources, natural gas, oil, and various minerals. These resources are needed, not only to meet growing demand at home and in East Europe, but also as

[1] Factual information cited below regarding specific industrial cooperative agreements and projects has been obtained from the following newsletter sources: Reuters—"East-West Trade News", Moscow Narodny Bank "Press Bulletin", "Soviet Business and Economic Report."

potential hard currency exports. The Soviet leadership's commitment to improve consumer welfare has also led to interest in importing whole plants or processes for the means of consumer goods production.

To sustain the desired level of imports, however, the U.S.S.R. must increase its exports to the West. As U.S.S.R.-Western trade has increased, the Soviet Union has incurred persistent annual convertible currency trade imbalances which averaged $240 million in the period 1960–69.[2] Since the mid-1960's, these deficits have been financed mainly by Western medium and long-term credits. The resultant indebtedness has meant an increasing debt service/export ratio, a factor which industrial cooperation is meant to ameliorate. In fact, a key feature of many industrial cooperation agreements is the commitment of the Western side to market the end product instead of simply providing equipment or a license.

The success of industrial cooperation as a strategy was, of course, contingent on the calculations of many Western countries that increased trade would serve their bilateral interests, vis-a-vis the U.S.S.R. In fact, most of the West European countries and Japan eased strategic export controls directed at the U.S.S.R. in the mid-1960's and, perhaps most significantly, extended the necessary credits to finance Soviet purchases. Only now is the United States adopting a similar approach.

Within this overall framework of mutual willingness to pursue increased economic cooperation, there remained, however, practical constraints largely rooted in Soviet institutional habits. These include the U.S.S.R.'s restriction on foreign equity and management participation and the reluctance to permit foreign onsite project surveys and free movement and access for foreign businessmen and technicians. These factors, combined with the U.S.S.R.'s persistent convertible currency shortages, necessitated novel approaches to secure the desired flow of Western goods and services and to develop new and more diverse Soviet exports. It is within these parameters that the U.S.S.R. has sought to conclude industrial cooperation agreements.[3] Four general types of agreement appear to be included.

II. Forms of Industrial Cooperation

(1) The U.S.S.R., first, has sought the conclusion of intergovernmental agreements on economic, scientific, and technological cooperation with Western countries to create an overall framework within which to increase collaboration and set the stage for detailed project agreements. Since 1966, eight such agreements have been concluded by the U.S.S.R. with West European countries, including France, West Germany, and Britain. These generally provide for the estab-

[2] Robert S. Kovach and John T. Farrell, "Foreign Trade of the U.S.S.R.", in "Economic Performance and the Military Burden in the Soviet Union", 1970, Joint Economic Committee, Congress of the United States, page 106.

[3] One point of clarification must be made. Industrial cooperation projects within the U.S.S.R. (or co-production enterprises, as they are sometimes called) are not joint ventures in the usual Western sense of the term. Neither foreign ownership nor foreign management participation is presently allowed in the U.S.S.R. Other East European countries, Romania, Hungary, and Yugoslavia, now have laws which permit minority foreign ownership. Even should the U.S.S.R. eventually move in this direction, the question would still remain whether the Soviet Union would allow foreign management to exercise decision-making powers over an enterprise which is part of a centrally-planned economy. Soviet officials have recently stated that for now Soviet policy will remain intact. (See, *Der Spiegel*, May 1, 1972, Interview with Dzherman Gvishiani, Deputy Chairman, U.S.S.R. State Committee for Science and Technology).

lishment of a mixed consultative commission and a number of subsidiary joint working groups which explore possible common ventures. In May 1972 the United States and the U.S.S.R. signed an agreement which establishes a U.S.-U.S.S.R. Joint Commision on Scientific and Technological Cooperation and provides for broad scientific and technological exchanges and for possible joint projects.

A variant to this approach is the conclusion of cooperation agreements between major Western firms and the U.S.S.R. State Committee for Science and Technology, which supervises and coordinates research and development in the U.S.S.R. Typically, such an agreement calls for exchanges of specialists and information, joint research programs, purchases of equipment and technology and licenses for production processes, and specialized consultations. Japanese and European firms have taken the lead in this area, but in recent months several U.S. firms, including General Electric, American Can and Occidental Petroleum, have concluded cooperation agreements with the U.S.S.R. Soviet officials apparently hope that such joint research endeavors will lead to joint patenting and sales of licenses and perhaps to joint projects in third countries.

(2) The second type of cooperation is the more conventional process of licensing agreements and importing whole factories or processes. Probably the most celebrated example is the 1966 agreement between the U.S.S.R. and the Italian firm, Fiat, to build a large automobile plant at Togliatti. Presently, the U.S.S.R. is also encouraging Western concerns to take on a continuing role in marketing the end product rather than simply selling licenses and equipment.

(3) The third form of industrial cooperation is specifically designed to facilitate exports to Western markets as well as enhance the U.S.S.R.'s industrial capacity.

One method to achieve this goal is the formation of joint or wholly-owned companies outside the U.S.S.R. Many of these concerns, which now number more than 30, are, in effect, foreign distributorships for Soviet products. Nafta-B, the oldest such operation, was established as a joint stock company in 1967 in Belguim to handle the export of Soviet petroleum products. Russebois is a firm engaged in the purchase and sale of timber and timber products in France. Joint companies have also been established in developing countries, including Ethiopia and Morocco, to promote sales of Soviet machinery and equipment.

A variation in this approach could be termed production-sharing. On a limited basis to date, agreements have been reached which involve partial manufacturing or assembly within the U.S.S.R., with the product usually then being marketed by the Western partner. A similar technique has been employed outside the U.S.S.R. In Belgium and Nigeria, the U.S.S.R. has established joint firms which operate facilities to assemble and market Soviet-produced automobiles.

The U.S.S.R. has also proposed creation of industrial joint ventures with Western firms in developing countries where the question of joint ownership would not present ideological obstacles.

Finally, the U.S.S.R. is proposing a form of cooperation in which the Western side would provide equipment and technology on credit for an industrial plant in the U.S.S.R., but would not receive any equity or supervisory rights as under a joint venture. Repayment of principal and interest would be in product from the new installation

at prearranged prices which guarantee a "profit" on the original investment. Long-term contracts, also on favorable terms, to supply product to the Western concern following credit repayment may also be concluded. In short, the U.S.S.R. would simply allocate a set percentage of the new plant's production for sale to the Western partner at a price which guaranteed an acceptable return on its investment.

The U.S.S.R. has already negotiated some agreements along these lines and is discussing others, including some with U.S. firms. In late 1972, the U.S.S.R. and two West German steel firms reached preliminary agreement regarding construction of a steel mill in the U.S.S.R. The German equipment, financed by bank credit, would be repaid with deliveries of iron pellets over a 10-year period.

The U.S.S.R., conversely, is seeking to export whole plants and equipment to Western countries as part of the industrial cooperative interchange. At the present time, the U.S.S.R. is supplying equipment for a metallurgical complex being constructed in southern France.[4]

(4) The best-known and potentially most significant form of industrial cooperation relates to natural resources development projects in the U.S.S.R., mainly in Siberia and the Far East. Typically the Western firm supplies equipment and technology on credit with repayment, usually deferred until the project is well on stream, in product at prearranged prices. Supply contracts following credit repayment may also be concluded. The immensity of some of these arrangements combined with their potential impact on East-West trade have resulted in their being monitored by top-level Soviet trade officials.

In this category is the series of agreements concluded since 1968 calling for provision to the U.S.S.R. of more than $1.2 billion of large-diameter steel pipe on credit by West European countries (Austria, West Germany, Italy, Finland, and France) in return for long-term natural gas deliveries; and two U.S.S.R.-Japanese deals to develop timber resources in the Soviet Far East and Siberia. Japan agreed to provide some $190 million in timber-production equipment in return for timber and wood chips.[5]

Under the various natural gas deals, the U.S.S.R. will supply West Europe with approximately 18 billion cubic meters of natural gas annually after 1975. Some of the deals amount to a simple barter of gas for pipe, but at least two, those with Italy and Austria will earn an estimated combined total of about $90 million annually once the original credits are repaid. The U.S.S.R. is using the imported steel pipe, mainly of 48 and 56 inch diameter, to construct a pipeline from the gas source in West Siberia to West Europe, a distance in excess of 5,000 kilometers.

Negotiations for these deals have generally been prolonged. The U.S.S.R., in effect, seeks to turn its position as a raw material exporter and machinery importer to advantage by demanding high product prices and credit terms of about six percent interest at a minimum of 5–8 years. Some of the deals, reflecting Soviet sensitivities on the matter, have involved concessionary interest rates which, however, have usually been recouped in the form of higher equipment prices. The deals have all been sizeable ranging from $100 million to in excess of

[4] *Izvestiya*, January 19, 1972.
[5] For an analysis of U.S.S.R.-Japanese cooperation in Siberia, see: Kiichi Saeki, "Japan in Siberia", *Problems of Communism*, May-June 1972, pp. 1–11.

$1.5 billion turnover for the U.S.S.R.-West German gas-pipe agreements of which there are now two.

The major Soviet contribution to such projects, in addition to local costs, is the natural resources which might otherwise not get to market for years for want of Soviet capital and technology. Indeed the Soviet negotiating position has generally been that the Western side must provide financed equipment if it expects to receive the natural resources. Only then could the requisite Soviet investment be factored into future plans. Any other arrangement, it is held, would disturb present investment plans and priorities. Viewed from this perspective, the U.S.S.R.'s desire to encourage Western governments to take a role in financing these projects not only reflects its preferred way of doing business but also the desire to obtain an added guarantee for the successful implementation of the project.[6]

The Soviet bargaining stance, however, does not fully take into account the U.S.S.R.'s intrinsic interest in Siberian development, principally for strategic purposes. A priority development project, the construction of a pipeline from the Tyumen oilfields in West Siberia to the Port of Nakhodka in the Soviet Far East, would facilitate servicing military as well as civilian installations in the Eastern U.S.S.R.

United States firms recently have been involved in discussing possible resource development projects, including the multibillion dollar development of natural gas and oil resources in the Tyumen province of Siberia and natural gas development in the Yakutsk region.

III. The U.S.S.R.'s Perspective

Industrial cooperation is a strategy designed to limit some of the financial and political ramifications resulting from increased trade with Western countries. It aims at reducing the U.S.S.R.'s convertible currency trade imbalances and winning access to specialized technological and scientific equipment and information, while at the same time husbanding Soviet investment resources. Indeed, some of the large-scale industrial and natural resource "barter"-type projects could produce a short-term negative balance of payments effect for the Western country partner since the initial capital outflow would not be repaid for several years under the usual extended repayment terms. The U.S.S.R., however, is cognizant of this problem and appears willing to spend returns derived from sales after repayment is completed for goods produced by its trading partner country, thereby reducing this concern.

Politically, industrial cooperation appears acceptable to a broad range of Soviet interest groups. For Party bureaucrats, it represents the means to modernize the economy without the necessity for major systematic modifications. In fact, until now the attraction for Western countries of political returns and of the "untapped" Soviet market, combined with the growing Western natural resource import needs have allowed the U.S.S.R. to deal basically on its terms. For Soviet technocrats and managerial groups, industrial cooperation offers increased economic and scientific exchange with the West and the prospects of introducing more efficient techniques into the Soviet economy.

[6] In fact, the financial requirements for some of the natural resource projects may be so large that even though the matter is expected to be handled primarily by Western private capital, government involvement would also seem to be warranted.

IV. Possible Obstacles?

Notwithstanding the U.S.S.R.'s relative success to date in concluding industrial cooperation agreements, several practical problems could impinge on the future outcome of the strategy.

Conclusion of the cooperative industrial and natural resource development deals depends on the Western concern's willingness to forego formal ownership or management rights, to rely on sometimes incomplete or inaccurate Soviet technical data, and to accept repayment in the particular product [at a set price] over an extended period. These arrangements have sufficed in the past. Still upcoming however, are the negotiations, primarily by U.S. and Japanese firms, on large-scale participation in Siberian development. The U.S.S.R. is apparently calculating that Western resource needs and the competition for new markets, combined with its own official guarantee of the terms of such projects, will enable it to sustain its bargaining terms. Ultimately, the Western firms' decisions will be made essentially on economic criteria, but with an eye toward the prevailing political situation. Negotiations will likely be extended and complex. Should the Soviet terms prove unacceptable, the U.S.S.R. could be faced with the choice of making some modifications in favor of potential investors or of risking a possible lower level of Western involvement.[7]

Should the large-scale cooperation agreements be concluded, the U.S.S.R. must still mobilize the financial, administrative, construction, and logistical resources needed to complete its share of the undertakings. Undoubtedly these projects would receive top priority in view of their hard currency earnings potential, but the necessary coordination on schedule of the inputs of several ministries is a potential problem.

If industrial cooperation proceeds on a broad scale, it will inevitably mean an expanded Western technical and commercial presence in the U.S.S.R. Increased opposition from ideological conservative elements is thus also possible.

Finally, in the area of scientific and technological cooperation and exchanges, both sides must continue to perceive tangible benefits if a long-term fruitful relationship is to evolve.

Conclusion

Industrial cooperation is the U.S.S.R.'s primary method of expanding on a long-term basis trade and technological cooperation with the West. As Premier Kosygin stated in his report on the Ninth Five-Year Plan (1971–75) to the Supreme Soviet on November 24, 1971:

> New possibilities are being opened up in our relations with the countries of the West as we undertake the conclusion of long-term agreements that ensure regular orders for industry. Consideration can be given to mutually beneficial cooperation with foreign firms and banks in working out a number of very important economic questions associated with use of the Soviet Union's natural resources, construction of industrial enterprises, and exploration for new technical solutions. We are convinced that diverse forms that are in the interest of all participants can be found for carrying out this cooperation.[8]

[7] Recent developments indicate that such problems can be resolved to the satisfaction of the Western partner. On April 12, 1973, an agreement was concluded between the U.S.S.R. Ministry of Foreign Trade and the Occidental Petroleum Co. This agreement provides for cooperation in the establishment in the U.S.S.R. of a manufacturing, storage and transportation complex for chemical products, and for mutual supply of superphosphoric acid from the U.S.A. in exchange for ammonia, urea, and potash from the U.S.S.R.

[8] *Pravda*, Nov. 25, 1971.

Implicit in the Soviet strategy of industrial cooperation is not only a commitment to the international division of labor but also a growing recognition that in the future the base of national power will be determined more by economic and technological criteria than by military hardware computations. In this sense, industrial cooperation represents the U.S.S.R.'s tacit acknowledgement that a strategy of economic autarky is impossible in an era of rapid technological change.[9] More specifically, it reflects a growing interest in producing for the export market and in mastering, or at least better utilizing, Western marketing techniques.

The prerequisites exist for a substantial expansion of East-West trade based on Soviet machinery and equipment import needs and the U.S.S.R.'s natural resources for potential export to Western markets. Unless the U.S.S.R. can increase its exports to the West, however, it may not be able to sustain its desired level of imports. Its success in this matter may well be linked to imports of Western equipment and technology. Ultimately, then, the decisions of Western firms and countries on industrial cooperation with the U.S.S.R. could hold a vital key to the development of East-West trade.

[9] Already at the 23rd CPSU Congress in 1966, Premier Kosygin had stated: "In our time it is becoming more and more evident that the scientific and technical revolution under way in the modern world calls for freer international contacts and creates conditions for broad economic exchanges between Socialist and capitalist countries." *Pravda*, April 6, 1966.

THE SOVIET MERCHANT MARINE, A LATE DEVELOPING ECONOMIC GROWTH SECTOR *

By NICHOLAS G. SHADRIN

CONTENTS

SUMMARY

The development of the Soviet Merchant Marine over half of a century has been extremely uneven. Up to about the middle of the 1950's it had not been distinguished either by the high rate of its development, its size, or the characteristics of its ships. What Captain A.T. Mahan, U.S.N., wrote at the end of the last century ". . . Russia has little maritime commerce, at least in her own bottoms: her merchant flag is rarely seen" [1] remained generally true. However, the existing merchant marine was able to satisfy the rather considerable dependence of the Soviet economy and certain regions of the country upon sea transport. Soviet merchant fleet could be small and still meet Soviet needs of that time because the Soviet Union was neither a trading nation nor a global power.

*An early draft of this paper was based on parts of the author's doctoral dissertation at George Washington University entitled *Development of Soviet Maritime Power,* submitted in June 1972.

[1] Quoted in *Reporter,* February 10, 1966, p. 25.

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The accelerated development of the Soviet Merchant Marine began in 1956 with an accelerated domestic East European and foreign shipbuilding program. For 15 years approximately 40% of the new ships were built in Soviet yards; about 50% were built in Socialist countries, particularly Poland and East Germany; and the remaining 10% came from Western Europe and Japan. The accelerated development of the Soviet merchant marine was more a result of increased trade and aid than a conscious decision or plan to expand their fleet. The rapid development of Soviet foreign trade and the initiation of far flung economic and military aid programs were far in excess of the Soviet Merchant Marine's capability, and hence forced heavy dependence, especially for trade, upon the charter market. Reliance on the charter market was costly in hard currency. Restrictive measures against ships carrying cargo to Cuba initiated by the American government and a boycott organized by Western oil companies against non-Soviet tankers carrying Soviet oil to Cuba aggravated the situation. These costs and restrictions led to unprecedented growth in the Soviet Merchant Marine for the period from 1961 to 1966.

The rapid growth resulted in raising the standing of the Soviet Merchant Marine in the world shipping community. Prior to World War II, the Soviet Merchant Marine was in 23rd place in world shipping (by tonnage), in 1960 it moved to 11th and in 1966 to 6th—the place it continues to occupy.

The conscious or planned development of the merchant fleet began with the Eighth Five-Year Plan (1966–1970) when the future, expanding needs became clear, and continued through the current Five-Year Plan (1971–1975).

The present Soviet Merchant Marine is sufficiently large and diversified to carry more than half of the Soviet foreign trade cargo, to deliver military and economic aid, to satisfy basic domestic needs in sea transport, and to earn enough foreign currency to pay for the Soviet charter of foreign ships and even supplement the Soviet need for foreign currency. The Soviet Merchant Marine is not yet in a position to control terms and determine shipping rates in the world shipping community. While occasionally able to provide competition to shipping countries in world commerce, it will for the foreseeable future be limited to the goal of providing for Soviet shipping needs.

In comparison with major mercantile fleets of the world, the Soviet Merchant Marine is not yet well balanced in terms of ship composition. It has very few bulk carriers, is just starting to receive container ships, and only planning to build lighters aboard ships (LASH). Small Soviet ships—well suited for trade with less developed countries of the world are abundant, whereas large modern specialized ships are small in number. While the unusually high proportion of general cargo ships provides the Soviet Merchant Marine with diversified capabilities, it is becoming an obstacle and often leaves them with a less profitable cargo and the necessity to resort to tramp service on international lines. The planned emphasis upon larger specialized ships should improve the situation. Liner service is being rapidly developed in the Soviet Union.

In various international maritime organizations, conferences, and agreements the Soviets tend to promote their own interests; however, they have been generally cooperative and understanding of other nations' problems. A more liberal U.S.-Soviet commercial shipping agree-

ment of October 1972, including greater access to each other's ports and reducing the lengthy advance notice of a ship's arrival, facilitates sea trade between the Soviet Union and the United States.

Soviet merchant fleet development is interrelated, more than in Western nations, to the whole of its maritime developments. Fishing, the Northern Sea Route in the Soviet Arctic, and maritime relations with the nation of the COMECON or CMEA all have economic and political aspects.

While substantial political and military benefits have been obtained by the accelerated development of the Soviet Merchant Marine, the prime reason for its expansion was economic. The major reasons for expansion were to provide transportation for Soviet foreign trade, and to improve Soviet balance of payments in hard-currency trade, especially by reducing the drain of hard-currency caused by charter of foreign vessels.

I. Main Stages of Development

The Soviet Merchant Marine was established 5 February 1918 by a decree on "Nationalization of the Merchant Fleet" signed by Lenin. However, most of the 947 nationalized ships were lost during the Civil War.

In 1925 the Soviet yards started to build new ships; in addition, ship procurement abroad was initiated. The merchant marine program calling for the construction of 698,000 tons of ships was approved by the Council of Labor and Defense in 1925. The First Five-Year Plan (1925–1933) set in motion plans to complete the restoration of Soviet Merchant Marine and to increase cargo sea transportation more than four times, port cargo turnover two times, and total tonnage of ships more than two times.[2]

Although the First Five-Year Plan was not fulfilled, the Merchant Marine added 136 new ships with a total cargo capacity of close to 500,000 tons (more than half were Soviet built). Only in 1932 did the total cargo turnover of the Soviet Merchant Marine reach the pre-revolution level.[3]

The Party directives for the Second Five-Year Plan (1933–1937) planned an accelerated development of Soviet Merchant Marine, but in fact the Merchant Marine received only 23 new ships during 1933–1934, with a total cargo capacity of 130,000 tons. The remaining three years of the second Five-Year Plan witnessed a sharp reorientation of Soviet industry toward military production. "In shipbuilding, Navy orders became predominant, and construction of merchant ships practically stopped. Partial reinforcement of the Merchant Marine was conducted through the purchase of ships abroad." [4]

The 18th Party Congress (March 1939) directives for the Third Five-Year Plan for 1939–1943, also projected the acceleration of the Merchant Marine development. According to the Plan, the merchant marine role in the country's transportation system was to be increased, new types of ship were to be built, ports improved, and the Arctic Ocean Northern Sea Route expanded. A considerable increase in capital investment was planned.[5] Despite a modest increase

[2] *Morskoy Flot*, No. 2, 1968, p. 3.
[3] *Morskoy Flot*, No. 1, 1967, pp. 5–7.
[4] *Morskoy Flot*, No. 2, 1967, p. 4.
[5] *Ibid.* No. 3, 1967 p. 7.

in civilian shipbuilding, little was done to improve the merchant marine prior to World War II. By 1940 the tonnage of the USSR Merchant Fleet approached 2 million tons, but the majority of ships were obsolete.

When the war started on June 22, 1941, a number of merchant ships were taken over by the Soviet Navy. The activity of all steamship companies was immediately subordinated to the needs of the military command, and firm military control over them was established.

The war took a heavy toll of the Soviet Merchant Fleet. Nearly half (380) of all ships were lost and practically all the remaining ships were badly in need of repairs. The Soviet Union collected all the Axis shipping it could as reparations. A number of ships, mainly Liberty-class, were obtained under Lend-Lease. In 1946 the total deadweight of Soviet Merchant Marine was under 2.5 million tons.

The plan for the restoration and development of the Soviet economy approved in March 1946 set out the following goals for the merchant marine: the delivery of 400,000 tons of ships, accelerated repair of suitable ships, capital reconstruction of a number of major ports, a 2.2 times greater cargo turnover in 1950 as compared with 1940, and a 2.5 times increase in production capacity of ship repair yards. The Plan targets were not met in 1950 although the Soviet Merchant Marine transported 33.7 million tons of cargo with a total cargo turnover of 21.4 billion ton-miles. Although the projected tonnage was not carried, the repair facilities were improved and ports restoration had begun.

During the 1951–1955 five-year period, the growth of the Soviet Merchant Marine exceeded that in the previous five-year period by 63.8%. More than half of the new ships commissioned were Soviet built. In addition, many ships underwent major repairs, the last time such an approach was employed on a large scale by the Soviet Union. In 1955 the Merchant Marine carried 53.7 million tons of cargo with total turnover of 37.2 billion ton-miles.[6]

The XX Party Congress directives for the Sixth Five-Year Plan (1956–1960), projected a merchant fleet growth by 1,600,000 dwt (to be built mainly by the Soviet and Comecon country yards) and increased participation of Soviet ships in transportation of foreign trade cargo.[7]

While the Sixth Five-Year Plan was never fulfilled (it was replaced by the 1949–1965 Seven-Year Plan), the measures provided in it did play an important role in the development of the Soviet Merchant Marine. While not contributing much directly, the Plan did set a definite trend, building up a prerequisite for the future accelerated development of the merchant marine. In effect, it was the first plan which was carried out during its initial three years as it had been set out: more funds were allocated and spent for ships at home and abroad, and more domestic shipbuilding capacity was allocated and utilized for civilian construction.

During the Seven-Year Plan period (1959–1965), the Soviet Merchant Marine underwent a truly unprecedented development. The plan for the merchant marine was revised upward twice, each time with a considerable increase in tasks. The first revision came after the 22nd Party Congress (October 1961), when it was decided to accelerate

[6] *Morskoy Flot*, No. 6, 1967, p. 7.
[7] *Ibid.*, No. 6, 1967, p. 7.

even more the already rapid growth of the Merchant Marine because the planned growth of the cargo capacity of the fleet was lagging behind the growing demand of the foreign trade, and, consequently, a considerable expenditure was required to charter foreign ships. The second increase was in 1963; as a result the original plan was fulfilled two years in advance. The increased tasks set for the Soviet Merchant Marine in 1963 were also over-fulfilled towards the end of 1965. According to the original plan, the cargo turnover was to increase by 220%, but the actual increase was 360%. In 1958 the Soviet Merchant Marine carried only 6.6% of the total cargo turnover for all types of transportation in the country, while in 1965 it carried 14%. In foreign trade, the cargo turnover increase was 480%. The total cargo turnover increased from 57.4 billion ton-miles in 1958 to 209.9 billion tons in 1965. The merchant fleet tonnage grew from 2,848,000 register tons in 1958 to 7,150,800 register tons in 1965, or 2.5 times. In 1958 the Soviet Merchant Marine had about 250 ships suitable for long hauls while in 1965 there were over 800 such ships. The Soviet Merchant Marine jumped from the 12th place in world ranking in 1958 to 6th place in 1965, becoming one of the youngest fleets in the world with almost 80% of its ships built in the previous ten years. Towards the end of the period, the Soviet Merchant Marine sharply increased its participation in the charter market.

Although the Eighth Five-Year Plan 1966–1970) was not fulfilled, actual performance was close to the planned figures. The fleet was augmented by 340 new ships totalling 4.5 million dwt, an increase of 42% over a five-year period. Total cargo turnover in 1970 amounted to 354 billion ton-miles, an increase of 70% over 1966. (In foreign runs, which accounted for 91% of the ton mileage, the increase was 78.4%).[8]

By the end of 1970, the Soviet Merchant Marine has established 65 foreign lines including 33 with a published schedules. In addition, there were many lines in coastal navigation.[9] Reporting to the Collegium of the Ministry of Merchant Marine, Minister Guzhenko stated that the Soviet Merchant Marine during 1966–1970 "assured the complete fulfillment of the cargo transportation requirement in coastal navigation, the independence of Soviet foreign trade from the capitalistic charter market, and assistance to fighting people of Vietnam, Egypt, and and other countries."[10] First Deputy Tikhonov added that, by satisfying the requirements of the Soviet national economy, the Merchant Marine fulfilled "the century-old dream of Russia's leading navigators."

The Five-Year Plan for 1971–1975, directives for which were approved by the 24th Party Congress in April 1971, provides for a further increase in Soviet Merchant Marine tonnage in excess of 5 million tons. Cargo turnover in all modes of transportation of merchant marine should increase by 1.4 times. In foreign trade the cargo turnover should increase by 42.3 percent (47 percent for dry-cargo fleet and 37.5 percent for tanker fleet). The plan provides for the construction

[8] The so-called Cuban Sea Bridge and the closure of the Suez Canal contributed considerably to this Soviet index. Day-in and day-out the Soviet Merchant Marine has had some hundred ships on the Cuban run, where total tonnage delivered in 1970 exceeded 9 million tons. The Soviet North Vietnamese lines were served in 1970 by more than 150 ships. The 1970 cargo carried to North Vietnam was said to be equivalent to about 1,000 trainloads. *New Times*, No. 10, 1971.

[9] *Morskoy Flot*, No. 3 1971, pp. 3–7.

[10] *Vodnyy Transport*, February 11, 1971.

TABLE 1.—SOVIET SELF-PROPELLED SHIPS OVER 100 REGISTERED TONS RECORDED IN THE U.S.S.R. REGISTER

Type of ship	1967		1968		1969		1970		1972	
	A[1]	B[2]	A	B	A	B	A	B	A	B
Passenger and cargo-passenger	186	485, 545	196	514, 773	203	511, 587	203	485, 602	201	492, 220
Dry cargo	1, 667	5, 791, 813	1, 710	6, 117, 164	1, 778	6, 588, 615	1, 819	7, 144, 573	1, 975	7, 824, 336
Tankers	360	2, 919, 106	382	3, 066, 737	403	3, 205, 605	425	3, 388, 652	434	3, 456, 793
Service and auxiliary	660	335, 147	667	334, 420	695	354, 563	698	333, 521	706	345, 125
Fishing	2, 629	2, 517, 377	2, 714	2, 741, 709	2, 800	2, 992, 445	2, 888	3, 263, 251	2, 863	3, 458, 697
Technical	306	267, 945	305	268, 425	315	275, 097	329	287, 749	342	301, 307
Others	205	156, 289	214	205, 186	226	253, 126	250	312, 059	272	412, 292
Total	6, 013	12, 473, 222	6, 188	13, 248, 414	6, 420	14, 181, 038	6, 612	15, 215, 407	6, 793	16, 290, 800

[1] Number of ships.
[2] Total capacity, registered tons.

Note: Data as of Dec. 31 of indicated years. Ships of Ministry of Fishing and other, primarily scientific, organizations are included.

Source: "Sudostroyeniye" No. 1, 1969; No. 6, 1969; No. 5, 1970; No. 5, 1971.

of new ports and modernization of existing port facilities. The plan called for greater specialization of newly built ships, wider implementation of automation, increased average tonnage of ships, improvement in management. These factors are expected to produce an increase in labor productivity by 24 percent and reduction in one-fifth of the crew.

Specialized ships to carry International Standards Organization (ISO) containers (40, 200, 300 and 700 20-ft. containers), timber carriers, bulk carriers of 50,000 and 32,000 dwt., ships for packetized and palletized cargo, refrigerators, roll-on/roll-off ships of 50,000–20,000 dwt are scheduled to be delivered in large series. The largest Soviet tanker, presently under construction, the 150,000 dwt "Krym" should be completed in 1974, and the construction of a series of such tankers is planned. Construction of combined ships (tanker-ore carrier) for bulk and liquid cargo is projected.

II. The Need For an Expanding Merchant Marine

A. Increasing Soviet Trade and Aid

Up to the middle of the 1950s the development of the Soviet Merchant Marine was dictated mainly by the internal economic needs and only partially by the demands of Soviet foreign trade, which were not substantial. Since the mid 1950s, however, there has been a considerable increase in Soviet foreign trade and an expanded Soviet program of economic and military assistance. Moreover the events in Cuba, Vietnam, and the Middle East especially increased the demand for shipping—to transport armament, equipment, and goods. The domestic requirements were increased for sea transport between Soviet ports, primarily associated with the development of new economic regions, in many of which land transportation is practically absent.

Since 1955, the expansion of Soviet foreign trade has exceeded the rate of growth of the Soviet economy. The growth of transportation of foreign trade cargo, in turn, exceeded the growth of the foreign trade. For example, during the period 1955–1967 the transportation of foreign trade cargo grew 4.2 times, while the value of the Soviet foreign trade grew only 2.8 times.[11]

The reasons for such rapid growth are both political and economic. On the political side, the obligations assumed by the Soviet Union toward a number of Arab countries, Indonesia, and India during the second half of the fifties were of definite importance. During the same period, trade with China continued to grow, and a considerable portion of it was carried by sea. Toward the end of the 1950s and the early 1960s what the Soviet call "the process of disintegration of the world colonial system" had intensified considerably. During 1960, for example, in Africa alone, 17 newly independent states were established. The Communist activity in Vietnam and particularly the victory of the Castro revolution in Cuba were of significant importance. Not all the above outlined events played an equal and permanent role in generating the demand for Soviet shipping. Some, like Cuba and Vietnam, left the Soviet Union with no choice but to increase trade

[11] N. D. Mozharov, *"Cooperation of Socialist Countries in the Area of Sea Transportation"*, Transport, Moscow, 1969, p. 62.

and aid. Others, such as Indonesia, had looked very promising, and hence worth a gamble. The third category of country such as the Arab countries, while generally ideologically alien, presented the Soviet Union with the opportunity to undermine Western positions in the region and hence with possible political and, in the future, perhaps economic gains. The break with China in the late 1950s forced the Soviet Union to reconsider its obligation toward certain countries, and as a result, to increase sharply its assistance to India. On the other hand, the break relieved the Soviet economy of a considerable burden, thus permitting more flexibility in trade as well as economic and military assistance.[12] The traditional Soviet design "to free the country of the capitalistic shipping market" and to have greater flexibility in the support of political goals should be added to that set of factors.

The peculiarity of the Soviet economy plays an important role, for, while the USSR is the second economic power in the world and produces sophisticated armaments, the overall level of Soviet technology is still below that in most the Western countries. This factor has given a peculiar character to Soviet foreign trade. While a positive balance of payments has been maintained in most of the years of Soviet power, the physical volume of Soviet exports and imports has varied sharply. Heavy, bulky, raw materials have dominated the cargo in Soviet export shipping. The increased foreign trade in monetary terms has been primarily with capitalist countries from which mainly items of advanced technology have been important. In return, a very few industrial goods produced in the Soviet Union could be sold in capitalist countries, and, hence, raw materials continue to remain the main item of Soviet export to them. In the trade with developing countries, the picture is reversed. All this produced a situation whereby in 1967 Soviet export sea shipments exceeded imports by nearly nine times in physical volume, as may be seen from the following table:

TABLE 2.—SOVIET FOREIGN TRADE SHIPMENT

	1960	1965	1967
Total:			
All means of transport (thousand tons)	99,310	173,910	206,683
Sea transport (thousand tons)	44,690	91,837	108,756
Share of sea shipment (percent)	45	52.5	53
Export:			
All means of transport (thousand tons)	84,376	151,767	184,563
Sea transport (thousand tons)	38,765	79,058	98,459
Share of sea shipment (percent)	46	52.0	67
Import:			
All means of transport (thousand tons)	14,934	22,143	22,120
Sea transport (thousand tons)	5,925	12,749	10,297
Share of sea shipment (percent)	40	57.0	46

Source: "Soviet Foreign Trade in 1967", Foreign Relations Institute, 1968, and N. D. Mazharov, pp. op. cit. 62-63.

At the beginning of the 1960s a discrepancy arose between the planned growth of merchant marine tonnage and the tonnage actually

[12] While the ideological, historical, and nationalistic aspects of the Sino-Soviet rivalry and break have been investigated in great detail, the economic aspect, with the exception of the difficulties the break created in China, has to a large degree been neglected. It is a firm belief of this writer, that China's needs and the Soviet Union's economic possibilities, primarily industrial capacity, were incompatible. The break, therefore, although producing clearly undesirable political consequences for the Soviet Union, simultaneously released considerable industrial capacity, permitting the Soviet government greater flexibility in its foreign trade, economic and military assistance.

required.[13] It forced the Soviet Union to increase considerably the chartering of foreign-flag ships, which in turn "reduced the effectiveness of foreign trade" or, in simple language, cost too much and forced the Soviets to pay in badly needed foreign exchange. Moreover, the shortage of ships imposed an added burden upon the other, already overloaded, modes of Soviet transportation, particularly the railroad system. This development probably explains why when a review of the seven-year plan for the development of the Soviet Merchant Marine was made, the result was an accelerated shipbuilding program at domestic yards and increased orders for merchant ships abroad. In 1962 the total annual increase in Soviet Merchant Marine cargo carrying capacity was equal to the growth of sea shipments of foreign trade cargo, and toward the end of the decade exceeded it. For example, the total tonnage in the tanker fleet increased from 741,000 RT in 1958 to 2,446,000 RT in 1965, or 330%.

One of the important factors improving the overall performance of the Merchant Marine is the development of foreign trade on the basis of the long-term agreements. Such a practice, clearly preferred by the Soviets, creates a more or less steady flow of cargo to and from certain geographic and political regions. It permitted the Soviet Union to establish "foreign trade cargo traffic directorates" and to establish five groups incorporating several such directorates, European, Middle East-African, South Asian, Far East, and American.[14]

The European Group, where close to one-half of foreign trade cargo is shipped, includes three directorates; the Mediterranean (Italy, France, Greece); the Scandinavian; and Continental (West Germany, Belgium, the Netherlands and Great Britain). Oil, oil products, coal, and timber are the main cargoes (by volume) in this group.

The Middle East—African Group includes five directorates; The Near East (Turkey, Syria, Lebanon, Cyprus); the Red Sea Countries; the Persian Gulf Countries; the North African Countries; the West African Countries. The largest cargo flow is to Egypt.

The South Asian Group includes India, Pakistan, Ceylon, Burma, Malaysia, Cambodia, Thailand, and Indonesia; *The Far Eastern Group*, Japan, North Korea, and North Vietnam; *The American Group*, Cuba, Brazil, Argentina, Canada, the U.S.A., Mexico and other countries of the Western Hemisphere.

Practically all major Soviet basins (Northern, Baltic, Black Sea-Azov, Caspian, and Far Eastern) are participating in more than one group through the steamship companies located there. Some steamship companies of a particular basin have been assigned to specific directorates, and also specialize in a particular cargo.

The Northern Basin companies specialize in shipments of timber and minerals, mainly to the European group, as well as delivery of coal to the USSR from Spitsbergen.

The Baltic Basin companies are mainly involved in shipments of industrial goods as well as coal and oil mainly to European and American (including Cuba) groups. The companies of the basin also participate in shipments to West Africa Groups.

The Black Sea-Azov Basin companies serve all five groups and carry a considerable portion of Soviet foreign trade, mainly oil,

[13] V. G. Bakaev, "USSR na morskykh putyakh" (USSR on World Sea Routes), Znanie, Moscow, 1969, p. 16.
[14] *Soviet Union Sea Transport in Fifty Years*, Moscow, Transport, 1967.

coal, cement, metals, machines, and sugar. The companies of Far Eastern Basin serve the Far Eastern and in part the South Asian and the American groups.

Up to 1965 the Caspian Basin provided partial deliveries of Soviet foreign trade cargo to Iran in addition to internal transportation of oil from Baku. Starting in 1965, but especially after the closure of the Suez Canal, it has been involved in the growing volume of Iranian cargo to and from Europe.

With the closure of the Suez Canal, the length and the duration of the North Vietnam runs from the Black Sea and the Baltic increased considerably, thereby requiring more ships to maintain even the same volume of cargo. While continuing North Vietnam shipments from European Basins, the Far Eastern Basin has been gradually assigned the larger share of cargo for North Vietnam. Shipment via railroad and the Northern Sea Route to be increased correspondingly.

The Soviet Merchant Marine has developed extensive liner service in four major categories: purely Soviet, operating jointly with other Socialist countries, jointly with capitalist countries, and jointly with developing countries. By the end of 1970, out of 65 Soviet lines, 15 were being operated jointly with Western shipping companies, and the number continues to grow. In April 1971, a joint Soviet-French line between Odessa and Marseille was opened, and in May, the Japan-Mediterranean Sea line became operational.

Starting in 1962, there was a gradual increase in the number of Soviet ships chartered by foreigners, with correspondingly greater earnings of foreign currency. In 1962, Soviet ships carried 1.9 million tons of foreign cargo, in 1965, 8.6 million tons, and in 1967, 15.7 million tons. Simultaneously, the number of foreign ships chartered by the Soviet Union increased. Chartering increased 4.4 times during the 1959–1967 period, and in 1967, 59.7 million tons of Soviet goods were carried by foreign ships, while the remaining 64.1 million tons of seaborne foreign trade cargo were carried by Soviet ships.[15] Soviet statistics are vague concerning the balance of charter in monetary terms, for they do not specify what percentage of cargo carried by foreign ships was transferred by the ships of CMEA countries. The Soviet Minister of Merchant Marine stated in 1969 that between 1964 and 1968 the merchant marine earnings of convertible currencies increased ten times. It is fair to assume that, at least in foreign convertible currencies, the charter balance continues to be favorable for the Soviet Merchant Marine.

B. The Requirements of CMEA

The activity of the Soviet Merchant Marine and merchant marines of Council for Mutual Economic Assistance (CMEA) or COMECON countries is closely coordinated in Section No. 3 of CMEA Permanent Committee for Transport. The Soviet organization Sovfrakht, in cooperation with its counterpart in CMEA countries, conducts a coordinated charter policy through the Charter Bureau. Coopera-

[15] Bakayev, *op. cit.* pp. 23, 25.

tion in mutual use of tonnage, charter of foreign tonnage, mutual use of ports, ship-repair bases, exchange of information, joint policy toward international regulations, etc. are well developed within the CMEA framework. Total tonnage of Socialist countries at the end of 1970 was 21.4 million registered tons, or approximately 9.4% of the world total.[16] The effectiveness of CMEA country merchant marines undergoes close examination during the monthly Moscow meetings of their representatives.

The attempts to coordinate activity of the CMEA countries' merchant marines goes back to its creation in 1949, in spite of the fact that both the merchant marines of the member countries and the foreign trade were very small. The acknowledged goal of such cooperation is the rational use of tonnage, coordinated action in the charter market, and, in general, increased effectiveness of foreign trade and improved balance of payments. In 1952 it was decided that the conferences of organizations involved in the charter market would be held on the annual basis. In 1957, the 8th Session of the CMEA organized a working group for transport, whose function among others, was to coordinate plans for foreign trade transportation. The 1958 9th Session of CMEA established a commission for economic, scientific, and technical cooperation in the area of transport. The commission coordinates plans for capital investment in transport development and research, and is responsible for mutual efforts to create scientific research centers and design bureaus. During the period of 1962–1965 the Commission coordinated plans for the development of sea transport of all CMEA members for 1966–1970 period.[17]

Considerable attention was devoted to the ship-building industries. It was decided to reduce the number of ships types built by CMEA countries from sixty to eighteen and to build specialized ships in large series assuring their technological modernity and suitability for the needs of the CMEA countries.

In 1963 the Bureau for Coordination of Ships Charter was created. The Bureau with headquarters in Moscow assisted in drafting the organizational principles of joint shipping lines. One of the reasons behind the coordination of ship charter is "to apply active influence upon world charter market through coordinated action". The proposals for creation of a CMEA charter center and liner conferences were under consideration in 1970. In December 1971 an important agreement concerning the CMEA countries' cooperation in shipping was signed by all members. The agreement is to assure the coordinated transportation of all foreign trade cargoes of the CMEA members, and rational distribution of cargo flow among ports of various countries and different ship lines.

In general, the development of the CMEA countries merchant marines has been as follows: In the 1951–1955 period, when the sea trade began to develop, the increase of their merchant marines was practically negligible (from 2.2 million tons in 1950 to 2.5 million tons in 1955). This growth was far behind the demands. The period witnessed a considerable dependence upon chartered ships.

In the period 1955–1960 the growth of merchant marines (2.2 times during the period) approximately corresponded to the tempo of

[16] *Morskoy Flot*, No. 1, 1971, pp. 47–49, and *Vodnyy Transport*, January 28, 1971.
[17] N. D. Mozharov, *"Cooperation of Socialist Countries in the area of Sea Transport"*, Transport, Moscow, 1969, pp. 76–80.

CMEA foreign trade development. However, it was not enough to overcome the lack of tonnage developed in the preceding period. During this period, the CMEA countries planned "to assure independence of foreign trade from capitalist charter market, to decrease spending of the foreign exchange for charter and to increase effectiveness of the foreign trade". However, there was no plan to eliminate the charter of foreign ships. The available statistics shows, that simultaneously with a fast growth of the CMEA merchant marines and the steadily increasing number of the Communist ships chartered by foreign countries, the CMEA countries charter of foreign ships has been increased as well.

Today, all members of the CMEA have rather modern merchant marines and generally follow merchant marine policies similar to those of the Soviet Union. Specialization of ships is well underway. The shipbuilding industries of the CMEA countries have been the most important "foreign" partners of the Soviets and have extensively exercised mutual deliveries.

C. The Developing World

For many years the Soviet Merchant Marine has maintained a few joint lines with developing countries. The joint line with India was organized under an agreement signed between the two countries on April 6, 1956, and about 20 Soviet and Indian ships are now serving the line. The joint line with Egypt was organized after the signing of an agreement on September 18, 1958.[18]

There have been frequent Western complaints about Soviet Merchant Marine deliveries of cargo of developing countries. Soviet spokesmen have countercharged that up to recent times Western shipping companies had no competitors in the developing countries, and hence dictated their own terms. Those companies have been accused of "squeezing more than two billion dollars annually from the developing countries for the transportation of their goods", and of being irritated at the "unselfish" Soviet assistance to the developing countries.[19]

Western shippers have charged that the Soviet Merchant Marine permits its ships to carry cargoes of foreign shippers on their return runs at cut rates, Soviet Minister of Merchant Marine Guzhenko admitted the charge, calling the practice "perfectly normal". He added that "many foreign shipping companies do the same and no one has yet accused them of engaging in economic subversion", and that "it would be absurd to deny that the Soviet Merchant Marine is interested in earning foreign currency".[20] In their counterattacks, the Soviet representatives accused the U.S. shipping companies of charging rates "more than double the world's standard" and of being subsidized by the government which has "introduced discriminatory regulations". They maintain that such practices are an indication of a crisis in U.S. shipping.

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[18] A. V. Voronkov, Yu. V. Klemen'yev, *Merchant Fleet of Soviet State*, Moscow, Znanie, 1971, p. 44–45 and *New Times*, No. 10, 1971.

[19] See for example, an article in July 1970 issue of *U.S. News and World Report*, and Soviet Minister Guzhenko's answer to it in *New Times* No. 34, 1970, pp. 27–29.

[20] *Ibid.*

D. Soviet-United States agreement

Following the massive purchases of U.S. grain by the Soviet Union, a U.S.-U.S.S.R. maritime agreement was signed in October 1972. Called "a valuable outgrowth of the Moscow summit talks" and "an indispensable first step in beginning the new era of expanded commerce" between the two countries, the agreement represents a major step toward reduction of tension in the world's maritime community.

The agreement reserves for each country's flag ships at least one-third of the cargoes carried between the U.S. and the U.S.S.R ports, allowing other countries' ships to compete for the remaining third. It opens 40 ports in each country for the ships of the other and stipulates a four-day notice. It is substantially less restrictive than the 14-day advance notice that previously existed for the Soviet ships coming to the U.S. ports and 30-day advance notice required by the Soviet Union for the American ships going to Soviet ports. For the ports not specified in the agreement, the previously existing rules and regulations continue to apply. The selection of ports was based on commercial considerations, reasonable reciprocity and interests of national security. Soviet ships which have called at Cuban and North Vietnam ports are still prohibited by the agreement to load or unload any government-financed cargoes in U.S. ports. The Soviet grain purchase represents such a cargo.

The special rates stipulated by the agreement apply through June 30, 1973. For example, the rates obligate the Soviet Union to pay $8.05 per ton for commodities shipped on American ships from Gulf Coast to Black Sea ports, or 110 percent of the world rate, whichever is higher. American ships delivering agricultural cargo will enjoy the special favorable unloading terms, in the Soviet ports, representing a reduction of at least $1.75 per ton.

E. River Transport

The vastness of the Soviet territory and the poorly developed land transportation system make rivers indispensible for the transportation of goods, raw materials, and people. In many areas, particularly in Siberia, river transport has been the only practical means of transportation in extensive use.

World War II not only interrupted the development of Soviet river transport, but inflicted considerable losses on it. More than 4,300 various vessels were lost, and hundreds of river ports and docks, 300 dams, and more than 60 locks were destroyed. A decree of the Council of Ministers of the U.S.S.R. of September 1, 1947 approved a special program for the accelerated development of river transport; the program played an important role, in rebuilding the Soviet river fleet.[21]

The directives of the Fifth Five-Year Plan approved by the 19th Party Congress (1956) considerably increased the appropriations for river transport and allocated a greater portion of the domestic shipbuilding facilities for the construction of river vessels. A special provision was made for reinforcing the Siberian river fleets, a goal which was reached later by the transfer of a considerable number of vessels via the Northern Sea Route.

[21] *Rechnoy Transport*, No. 4, 1970.

But the most rapid development of Soviet river transport took place in the sixties, when the river fleets received thousands of new vessels. New waterways connecting all the seas washing the European part of the Soviet Union were opened, making Moscow a real "port of the five seas". A new mode of water transport, the so called "mixed river-sea" was developed, and thus river transport gradually became involved in carrying foreign trade. Furthermore, the development of the rivers in Siberia and the Far East, so essential for the exploitation of the rich natural resources in those areas, was accelerated.

In 1970, the Soviet river fleet transported 358 million tons of cargo. The total cargo turnover amounted to 174 billion ton-kilometers. The largest increase in the transportation of cargo by river fleet is planned to take place in the northeastern region of European Russia and the Siberian rivers (particularly Western Siberia).

In 1975 total Soviet river transport cargo turnover is planned to be 216 billion ton-kilometers. Considerable improvement is planned for passenger service. Presently there are more than 150 passenger lines served by high speed boats (mainly hydrofoils). The number of passenger lines is planned to be increased considerably with introduction of aircushion ships.

Until recently, the low cost of river transportation was the main advantage of this mode of transport. However, during the last decade, the rate of decrease in transportation costs in the river transport slowed down.

Since 1966 there has been no trend toward further decrease in transportation cost. The most important reasons are the following:

(1) The capacity of existing ports and their mechanization does not match the number of ships already in operation, and lags behind in rate of development. More than 36% of navigation time is spent by ships in port.

(2) A number of technologically advanced ships designed, and some even with prototypes tested, were not built or were delayed in construction due to the lack of allocated shipbuilding capacity.

(3) The previous plan (1966–1970) to supply river fleets with new ships was not fulfilled, and 140,000 tons of total cargo capacity of tankers and dry cargo vessels as well as 380,000 tons of total cargo capacity of non-self-propelled vessels were not delivered to the river transport.[22]

In accordance with the new plan for 1971–1975, accelerated construction of river ports with the introduction of technologically advanced cargo handling equipment and increased allocation of the shipbuilding industry capacity for river vessels were promised. Party directives specifically projected delivery of river vessels with larger cargo capacity, including a considerable increase in ships of mixed sea-river navigation.

F. Northern Sea Route

The Arctic Ocean differs sharply from all the other regions of the world ocean with respect to its climatic and especially its ice conditions. The Soviets consider the development of the Polar Regions and the Northern Sea Route one of the brightest pages in the maritime history of Russia. As Captain O. P. Araldsen, Royal Norwegian Navy,

[22] *Ibid.*

observed "the October 1917 Revolution changed many things, but not the Russian preoccupation with the Arctic." Prior to World War II, duration of navigation reached over a hundred days in the western part of the Northern Sea Route and over seventy days in its eastern part.

After the war the efforts for further mastering of the Northern Sea Route continued. Systematic, planned research in the Arctic was intensified during the period 1948–1951, followed by three years of passivity. Since 1954 the Soviet Union has maintained at least two drifting stations on the ice. Polar aviation was reinforced with a greater number and better quality of aircraft. By the mid-1950s the Northern Sea Route was fully operational.

The reinforcement of the Soviet Icebreaker's Fleet came in the mid-1950s when three ice-breakers of Kapitan class (*Kapitan Belousov*, *Kapitan Voronin*, *Kapitan Melekhov*) were built for the U.S.S.R. by Finland. In 1959 the nuclear powered ice breaker, *Lenin*, the most powerful ship of this type, was built. During the 1960s five units of Moskva class ice-breakers were built.

In the decade of the 1960s, the Soviet Union built two icebreaker-type hydrographic ships—Petr Pakhtusov (1966) and Georgii Sedov (1967)—both with 5,400 SHP. A large Series of harbor icebreakers, V. Pronchistsev-class, was also built in the decade of the 1960s.

Soviet experience in the Arctic, however, convinced them that more powerful icebreakers and in greater number are needed in order to prolong navigation along the Northern Sea Route and make it more reliable. As a result, the Soviet Union ordered three large icebreakers to be built during 1971–1975 period by Wartsila, Finland. The 20,000 ton ships will be powered by diesel-electric plants of 36,000 SHP. They will be among the most powerful motor ships in the world.[23] Another Soviet plan projects construction of two nuclear powered icebreakers of Arktika Class. With their help, it is planned to prolong navigation along the complete Northern Route up to six months, and to make navigation in the route's western and eastern areas uninterrupted during the whole year. In addition, it is planned to double the speed of the ships following the new nuclear icebreakers.[24]

TABLE 3.—SOVIET ICEBREAKERS

Major elements	Class (number of units) year of construction					
	Lenin, 1959 [1]	Moskva (5) 1960–69 [1]	Kapitan (3) 1954–56 [2]	Sibir [1] 1938 [2]	Krasin, 1917 [2]	Sibiryakov, 1925 [2]
Displacement	17,000	15,300	5,300	10,000	9,000	5,000.
Type of engines/total power.	Nuclear/ 44,000.	Diesel-electric/ 26,000.	Diesel-electric/ 12,000.	Steam/ 11,100.	Steam/ 11,400.	Steam/ 9,500.
Number and power of main engines.	2 x 10,000, 1 x 20,000.	1 x 11,000, 2 x 5,500.	4 x 3,500 (2 stern, 2 bow).	3 x 3,700	3 x 3,800	1 x 2,890, 2 x 3,280.
Total SHP	All electric motor 40,000.	All electric motor 22,000.	Electric motor, 10,500.	11,100	11,400	9,440.

[1] Liner icebreaker.
[2] Auxiliary icebreaker.

Source: V. Arshenevskii, "Icebreakers," Transport, Moscow, 1970.

[23] *Vodnyy Transport*, 15 October 1972.
[24] *Izvestiya*, 21 February 1970.

But, it would be incorrect to assume, that nuclear icebreakers will soon represent the backbone of the Soviet icebreaker fleet. More likely, the conventionally powered icebreakers will continue to play the most important role. Increased power of their propulsion plants and improved hulls would make them as reliable as nuclear vessels, but much cheaper.

No country in the world is afflicted with as much loss and inconvenience as the Soviet Union during the winter. Almost every sea which washes Soviet territory freezes over. In severe winter the eastern part of the Baltic Sea is frozen up to 140 days. Even Odessa, a Black Sea port, is sometimes frozen in for up to 100 days in a year.

In addition to weather and navigational aid services and a fleet of icebreakers, an essential element for successful navigation in the Arctic is ice reconnaissance. The best, of course, and most productive is air-ice reconnaissance, and Soviet Polar Aviation has been employed for this purpose for many years. Up to recent times, the major means of ice reconnaissance were visual and photo reconnaissance—both depend heavily upon weather conditions.

In 1970, the system called TOROS (translated ICE HAMMOCK) for the ice reconnaissance and assisting ice breakers and ships in ice navigation was successfully tested.[25] The system, installed aboard an aircraft, incorporates as its major element side-looking airborne radar. All weather operation and the ability "to see" through the snow and observe ship tracks in the ice field was claimed for the system. The high resolution picture is simultaneously registered on the scope and video-tape, and via photo-telemetry transmitted to ships and to shore control points. Simultaneously with the picture the system produces the exact coordinates of the aircraft which carries it.

Another radar device designed to measure the thickness of the ice field from an airborne helicopter was tested during 1971. A cross section cut of the ice field is displayed on the screen of the equipment. Many Soviet icebreakers and some merchant ships, particularly those with ice reinforced hulls, are carrying or are capable of carrying helicopters. These helicopters equipped with the above device (especially coupled with photo telemetry capability) would help not only to improve and simplify ice reconnaissance but would increase productivity of ice breakers by permitting them to select thinner ice for a passage. The equipment could, under certain conditions, permit ships with ice reinforced hulls to navigate alone without assistance from icebreakers.

The importance of the Northern Sea Route is elevated by the numerous north-flowing navigable rivers of the country (Pechora, Ob, Yenisey, Khatanga, Olenek, Lena, Yana, Indigirka, Kolyma and others) connecting it with the northern regions of the USSR. There is an extensive network of ports, the majority of which have been developed during the years of Soviet power. Among those of particular economic importance are: in the Barents Sea—Pechenga, which exports copper-nickel ores, and Nar'yan-Mar, a port for the export of bituminous coal from the Vorkuta Basin and timber that has been rafted down the Pechora; in the Kara Sea—Kilson and Dudinka, which provide an outlet to the sea for the production of the Noril'sk mining region, and Igarka, the largest center of timber export; in the

[25] *Pravda*, May 3, 1970; *Morskoy Flot*, No. 9, 1970, pp. 27–28.

Laptev Sea—Nordvik, Khatanga, and Tiksi, the maritime gateways to Yakut; in the East Siberian Sea—Ambarchik and Pevek, rapidly growing seaports and industrial centers of the Northeast.

The Soviet North is the richest base for the wood-chemical industry, and a leading world exporter of timber. It is also rich in useful minerals—mineral fuel, iron ores, phosphates, various construction materials, bauxite, copper, and a number of other nonferrous and rare metals. New industrial regions are being rapidly developed there.

The Twenty-Fourth Party Congress Directives for the Five Year Plan (1971–1975) projected further development of the Northern Region. The special attention in the directives was given to Norilsk Metallurgical Combine. The industrial development of the region which started in the decade of 1960's had already absorbed 24 billion rubles of capital investment, more than doubling the sum spent in the previous forty years, 1920–1960.[26]

The development of the Arctic region has been accompanied with a number of original solutions. An urgent demand for power for example, generated design, construction, and beginning of operation in the end of 1970 of a Floating Gas-Turbine Power Station, Northern Lights (20,000 KW). A decision was made to build a series of such power stations which can be placed anywhere where there is waterway (bay, channel, river) which permit passage of a ship with 1.55m draft.

The North Sea Route has been used practically exclusively by the Soviet ships and legally nobody challenged it. With the growth of its merchant marine, however, and the development of much wider cooperation with maritime organizations of the world, the Soviet Union is starting to change its position. Convinced that the mastery of the route has been achieved and the navigational period has been increased, and probably motivated by the desire to obtain some reciprocity for the Soviet merchantmen in other parts of the world, the Soviets have begun promoting the route for foreign shipping. The new Soviet approach began in 1966 but became particularly evident after the closure of the Suez Canal in 1967. The economic advantages for certain shipping to use the Northern Sea Route are obvious. The length of the route from Murmansk to Provideniya (southern part of the Bering Strait) is 3,400 nautical miles.

The Murmansk-Vladivostok distance via the route is 6,100 miles, while via the Suez Canal, more than 12,000 miles. From London to Yokohama via the route is 4,330 miles shorter than via the Suez Canal. In spite of some reduction in speed while transiting the ice a ship saves an average of 13 days in one direction via the Arctic Transit from London to Yokohama compared with that via the Suez Canal. In 1967 the Soviet Ministry of Merchant Marine announced the plan to open traffic along the Northern Sea Route between ports in Western Europe and the Pacific Ocean. The use of ice-class ships was proposed. The Soviets promised to support such navigation with icebreakers, polar aviation by the Hydrographic Service, and by special "scientific-operational groups" from the Hydrometeorologic Service. Referring to the difficult navigation and the ice situation in Volkitskiy Strait, the mandatory icebreaker and pilot use was specified for the convoys. Northern Sea Route Sailing Instructions were published for the convoying of foreign ships. The scale of fees for the icebreaker and pilot

[26] *Komsomol'skaya Pravda*, March 14, 1971.

were announced. The Northeastern Administration of the Merchant Marine was established in the center of the Arctic with headquarters in Tiksi with primary mission to support transportation and further development of navigation along the route.

To summarize: (1) The Soviet Union successfully continued the Russian efforts of long duration to master the Northern Sea Route and advance in the Arctic Region; (2) the development of Arctic and Siberia regions with their wealth of natural resources drastically elevated the importance of the Route; (3) constantly increasing Soviet foreign trade, associated with rapid growth of Soviet Merchant Marine, added to route's importance; (4) the use of the route by foreign shipping, though up to now slow in developing, would probably be intensified in the future; (5) the efforts to prolong the navigation along the Route have already borne results and will doubtless continue.

III. Aspects of Soviet Merchant Marine Expansion

A. Fleet Composition

One of the major features of the Soviet Merchant Marine is its serial composition. Large-scale standardization of ship types was accomplished at the beginning of the 1960's, when more than 30 different types, which used to be produced for the Soviet Merchant Marine, were reduced to 11.[27] The use of a standard design for ships and ship machinery allowed the Soviet Union to build ships in large series, to improve the training of crews and operation of ships and of ship repair facilities. Long-term planning, although it did not always work smoothly, has been a contributing factor to improving the composition of the merchant marine and its performance, including expansion of liner services. It has been claimed that the economic gains from the above measures are in the tens of millions of rubles.

Dry cargo, particularly general cargo, ships are in the largest number in the Soviet Merchant Marine. Most of them can carry bulk cargoes and heavy and long cargoes, have removable hatches, making it possible to open the deck wide. They are the best suited for carrying a variety of military cargoes.

The dry cargo ships, which were built in large series during the last decade, are by class: *Leninskii Komsomol* class, built in Nikolaev and Kherson, with 16,000 tons deadweight and speed about 19 knots; *Kapitan Kushnarenko* class, essentially the same design as *Leninskii Komsomol*, but with a 13,500 hp diesel instead of a 13,000 hp steam turbine; *Poltava* class, built during 1960–1967 in Nikolaev and Kherson, with 12,500 dwt and speed around 17 knots; *Slavyansk* class, with 12,900 dwt and a speed of 18 knots. One of the *Slavyansk* class ships has completely automated control of the propulsion unit.

The dry cargo ship classes built in large series abroad include the *Omsk* class, 14.9 thousand dwt, built in Japan; the *Beloretsk* class, 14.9 thousand dwt, built in Denmark; the *Pula* class with 14.2 thousand dwt, built in Yugoslavia; the *Krasnodar* class, built in Finland, the *Murom* class built in Poland, and the *Vyborg* class built in East Germany, all between 12.4–14.9 thousand dwt and with a speed of 17–18 knots. The Soviet Merchant Marine has about 250 timber carriers of 2,000–7,000 dwt, which carry more than seven out of the ten million

[27] *Morskoy Sbornik*, No. 7, July, 1963, p. 12.

tons of exported timber annually. Two series of large timber carriers, the gas-turbine propelled Vyborgles of the same tonnage, and a large series of medium and small timber carriers of 3.3–4 and 1.4–2.4 thousand dwt respectively were built in Soviet yards. In addition, a large series of Volgales class ships of 5.8 thousand dwt was built in Poland, and of Kotlasles class ships, in Finland. Many Soviet dry cargo ships have ice-reinforced hulls and are suitable for navigation in northern areas with, and under certain conditions without, ice breakers.[28] The current Five-Year Plan provides for the construction of a number of bulk carriers and other specialized ships. A large ore carrier, *Chernomor'ye*, 50,000 dwt, is under construction in Okean, one of the Nikolaev district shipyards. The Soviet-built bulk carrier "Zoya Kosmodem'yanskaya" (50,000 dwt) was launched at the beginning of 1973. The first Soviet-built container ship, the Sestroretsk, carrying 218 20-ft. containers was put in service in 1972.

Tankers constitute close to 40% (5,000,000 dwt) of the total Soviet Merchant Marine tonnage. Although the average tonnage of the Soviet tanker is still below that of the world's major maritime nations, it is steadily growing. Besides, the size of Soviet tankers has been dictated by the depths in home ports and in ports of the foreign countries with which the Soviet Union trades. Eighty-five percent of the tankers were built during the 1960s. The Soviet-built Sofiya class ships of close to 50,000 dwt are at present the most advanced and largest Soviet tankers. They have hull reinforcement for ice navigation, and some have been built for foreign ship owners. Starting in 1967, a large series of Velikiy Oktyabr' class tankers of 15.2 thousand dwt was built. Also starting in 1967 a large series of small tankers, the Baskunchak class, of 1.6 thousand dwt, was built in the Soviet yards. But the majority of Soviet Merchant Marine tankers were built abroad. Between 1962 and 1965 Japan delivered tankers of the Lisichansk class of 35,000 tons dwt; Italy, the Leonardo da Vinci class of 49,000 dwt; Yugoslavia, the Split class of 20.5 thousand dwt; Poland, the Bauska class of 19,000 dwt and International, of 20,000 dwt; Finland, the Pevek class of 4,200 dwt. Several tankers were modified for refueling naval ships, and some tankers are used for delivering fuel to naval bases. The largest Soviet tanker, Krym, 150,000 dwt is under construction. One-fifth tonnage of Soviet tanker fleet is annually chartered by foreign companies.

The present Soviet passenger fleet has about 80 ships for unlimited navigation and several hundred small ships for coastal navigation, including hydrofoils serving local passenger lines. About 60% of the larger passenger ships are less than ten years old, and all are serially built. There are seven passenger ships of the *Ivan Franko* class for 700 passengers, with a speed of about 20 knots; 19 ships of the *Mikhail Kalinin* class for 300 passengers, and 9 ships of the *Kirgizstan* class for 240 passengers.

The Soviet passenger fleet now operates 16 international lines connecting the U.S.S.R. with 22 countries. The Soviet General Maritime Passenger Agency (v/o *Morpasflot*) has been promoting tourism aboard Soviet passenger ships. In 1968 the Black Sea Liner, *Shota Rustaveli*, made her first trip around the world. Mixed cruises involving several modes of transport are now being organized.

[28] A. V. Voronkov, *op. cit.*, pp. 16–18.

B. Some Factors Determining Designs and Construction

The Soviet shipbuilding practice is dictated not only by available production capacities and experience, but the economic factor as well. The profitability of a planned ship, its suitability to the planned environment of operation, i.e. the search for the optimality is an important factor in the decisionmaking process. A very illustrative case is the Soviet Union's approach to tanker construction and the composition of the tanker fleet. Table 4 below shows the economic performance of various sizes of Soviet tankers and includes required capital investment and operational expenditures determined on the basis of the transportation of 1,000,000 tons of oil at the distance of 5,000 miles.

TABLE 4.—ECONOMIES OF SCALE IN TANKER CONSTRUCTION AND OPERATION

Tankers cargo capacities	Speed (knots)	Unit construction cost (thousand rubles)	Million rubles— Capital investment for fleet	Annual operational cost of fleet	Cost of transportation of 1,000,000 tons of oil at 5,000 mi.
Thousand deadweight tons:					
10	15	3,960	40.1	6.68	10.68
20	16	5,700	29.1	4.95	7.86
35	17	8,230	24.4	4.00	6.44
50	17	9,700	20.2	3.45	5.47

Source: M.A Gnatkov, "Giants of the Ocean Roads", Znanie P. H., Moscow, 1969, pp. 18-33.

For a 25,000 dwt tanker fleet the cost of transportation of 1,000,000 tons of oil for 5,000 miles is 7,190,000 rubles. The 50,000 dwt tanker fleet reduces this cost down to 5,47,000 rubles, or by 24%. However, the corresponding increase in size of 50,000 dwt tankers fleet to 100,000 dwt tankers fleet produces considerably smaller increases amounted to 10–12%.[29] All data represents Soviet cost and are correspondingly valid only for the Soviet tankers. Operational realities, i.e., ports (cargo handling capacity, their sizes, depths, storage facilities, inland transportation, etc.) and requirements of the line(s) (availability of cargo flow, demand for it, their stabilities, competition, etc.) are factors (variables) considered by the Soviet specialist in the selection of required ships and their number to be constructed or ordered.

During the decade of the 1960's the size of tankers delivered grew from 20,000 dwt to 50,000 dwt.

TABLE 5.—TANKER, BY COUNTRY OF ORIGIN

Class (country of construction)	Cargo capacity (thousand tons)	Power (thousand horsepower)	Speed (knots)	Draft (meters) m.
Velikii Oktyabr' (U.S.S.R.)	15.0	9.9	16.0	8.5
Bauska (Poland)	19.0	7.8	15.5	9.2
Split (Yugoslavia)	20.8	12.0	17.1	9.2
Warshava	30.5	19.0	18.5	10.65
Leonardo DeVinci (Italy)	48.9	19.0	17.4	11.65
Sophiya (U.S.S.R.)	49.4	19.0	17.2	11.6

Source: M. A. Gnatnov, op. cit., pp. 24–26.

[29] M. A. Gnatkov, *Giants of the Ocean Roads*, Znanie P. H., Moscow, 1969, p. 4.

At the beginning of 1969, the Soviet tanker fleet was composed of: about 20% of tankers with 10,000 dwt or less cargo capacity; about 30% of 15–25,000 dwt cargo capacity ships; and about 50% of 30–50,000 dwt cargo capacity ships.[30] Meanwhile, the process of average tonnage growth in the world tanker fleet had started during the second half of the 1950's. Most of the giant tankers in the following decade (with the exception of Manhattan built in the U.S.) were built in Japan:

Sinclair Petrole, 56,089 Tons—1956.
Universe Apollo, 104,520 Tons—1959.
Nissho Maru, 130,250 Tons—1962.
Idemitsu Maru, 206,000 Tons—1966.

This trend was accelerated by the closing of the Suez Canal. With more than 50% of the oil imported by Europe coming from the Middle East, cheaper transportation had to be found, and was. The answer was even larger tankers with huge capacities making it economical to go around Cape of Good Hope (approximately 11,000 miles) to Europe or America. These tankers outgrew both the Suez and Panama Canals. Even if previously announced plans to deepen the Suez Canal materialize, no more than 200,000 tonners would be able to navigate it. (In 1968, 326,000 tonners—Universe Island were built in Japan, at the begining of the 1970's, 400,000 tonners were designed and built, and a plan to design a 1,000,000 ton tanker was announced.)

Such a trend could not help but influence the leadership of the Soviet Merchant Marine and its scientific-research and design institutions, and subsequently led to a speed-up in the trend toward larger tanker construction. Initially, in 1968, the 100,000 dwt tanker was favored. Even the name of the headship in the class, *Moskva*, was selected, which indicates the completion of at least preliminary design. However, at the end of that year a number of articles appeared arguing for a larger tanker. During the following year, debates were published under the general headline "What shall the new large tanker be?" While various conclusions and opinions were expressed regarding the technical details of the proposed ship, opinions on the size of the ship were surprisingly similar. Leaving the technical arguments aside, the arguments concerning the size can be summarized as follows:[31]

(1) the tanker should be able to enter major domestic oil ports;

(2) the tanker size and its draft should present no problem in the passage of major canals (Suez, Panama);

(3) the tanker must be able to navigate through major straits, particularly Bosphorus, safely and without assistance from tugs and without interruption of other traffic;

(4) the ship should be able to profitably participate in foreign trade, transportation of oil among domestic ports, and the foreign charter market.

Researchers at the Central Scientific Research Institute of the Merchant Marine (TsNIIMF) expressed several reservations about construction of giant tankers. A major criticism was that the huge ships would be vulnerable during wartime because of their low speed, poor

[30] *Ibid.*, p. 24.
[31] The approved Souzmorniiproekt plan projects the increase of guaranteed depths of many Soviet ports, assuring entrance of ships with a draft of up to 17 meters. *Morskoy Flot*, No. 12, 1969, p. 20.

maneuverability and the huge target area they present for submarines and airplanes. Other TsIIMF reservations included: possibility of catastrophic consequences in case of accident; lack of maneuverability; the small number of ports which are equipped to handle them; the high cost of any shipping delays; and the high construction costs.

The institute concluded that during the 1970s, the basic deadweight of tankers would be between 100,000 to 300,000 tons. Tankers with 125,000–150,000 dwt would have the advantage of passing the Suez Canal while loaded, while tankers up to 250,000 dwt will be able to navigate it while in ballast.[32]

At the end of 1969, the Collegium of the Ministry of Merchant Marine considered the arguments, and "mainly, on the basis of economic considerations," selected the tanker designed by the group headed by chief-designer, N. N. Rodionov. The main characteristics of the tanker are as follows:

(150,000 dwt, about 180,000 tons displacement);
propulsion plant—steam-turbine, 30,000 h.p. with the reduction gear and variable pitch propeller;
speed—16.5 knots;
dimensions—L=293 meters; B=45 meters; L/B ratio around 6;
draft 16–17 meters;
endurance—20,000 miles (80 days);
unloading time approximately ten hours, considerable degree of automation (machine watch—one man) and computerized navigation, crew 36.[33]

The design establishes a standard for the future Soviet tanker. This tanker will probably not be in production before the second half of the 1970s.

A similar approach has been taken in consideration of other types of ships, particularly ore carriers. The Soviet Merchant Marine, up to the end of the 1960s, had few bulk carriers. Their role has been assigned to the universal ships, such as the 23,000 ton Zvenigorod class.[34] The first relatively large bulk carrier, Baltika with a 35,800-ton cargo capacity was built in the Soviet Union in 1968. The larger bulk carriers are presently being built and bulk carriers up to 80,000 tons are planned.

In the dry cargo ships category, the largest ship up to the end of the 1950's, was the American built Liberty class. During the decade of the 1960's, in addition to foreign deliveries (14,150 dwt Omsk class—Japan; 14,480 dwt Beloretsk class— Denmark; 12,375 dwt Vyborg class—East Germany), the Soviet shipbuilding industry built several classes of dry cargo ships for use by the Soviet Merchant Marine:

Leninskii Komsomol—16,080 dwt.
Bezhitsa—12,640 dwt.
Kapitan Kushnarenko—15,768 dwt.
Slavyansk—12,680 dwt.

All of these cargo ships had speeds of 17 to 18.5 knots.

[32] TSNIIMF, *Transactions*, Vol. 133, 1970, pp. 60–63.
[33] *Morskoy Flot*, No. 12, 1969, p. 20; *Nedelya*, No. 48, 1969; *Izvestiya*, December 4, 1969; *Leningradskaya Pravda*, January 1, 1971; *Sovetskaya Rossiya*, February 21, 1971; *Sudostroyeniye*, No. 4, 1970, p. 18; *Vodnyy Transport*, January 8, 1971.
[34] M. A. Gnatnov, *op. cit.*, p. 18 and 33.

Both domestic and foreign built ships were produced in large series. The optimality concept, i.e. size, power, degree of automation, were determined by the criteria of conditions of operation to achieve maximum possible profitability.[35]

C. Containerization

The overall importance and magnitude of the cargo handling problem in the Soviet Union can be illustrated by the following. According to recent data, the number of workers involved in cargo handling in the USSR in 1970 was eight million, after increasing at the rate of 250–300,000 annually.[36] The Soviet Institute of Transport Problems states that the total cost of load-and-storage operations is approaching 15 billion rubles per year.[37] The annual consumption of some packaging materials in 1969 amounted to 600 thousand tons of steel, 48 million square meters of lumber, and 450 million square meters of fabric.[38] Bulk transportation of cargo has resulted in substantive annual losses, including 2 billion bricks, 18 billion square meters of glass, and 3 million tons of cement.[39]

The Soviet Union has developed an extensive package-handling system, including the handling of containers. In 1971 about 32 million tons of cargo were transported in more than 1,000,000 containers in use. But most containers were of the three-ton size.[40] The number of large containers meeting International Standard Organization (ISO) specifications are small, and as of 1970 these containers were not being mass produced.

At the beginning of 1973 the situation had not changed drastically. The demand for containers was satisfied by only 30 to 40 percent, and the Ministry of Heavy Machinery and Transport Building, which was responsible for organizing mass production of ISO containers, was still searching for an enterprise to which to delegate the production responsibility. The owner of the largest number of containers in the Soviet Union is the Ministry of Railroads, which possesses 724,000 units of 1.25, 3 and 5 ton capacity.

The problem faced by the Soviet Merchant Marine is even more acute due to the rapid introduction of containerization among leading maritime powers and their successes in the highly competitive charter market. Containerization has been introduced into conferences of which the Soviet steamship lines are members. Due to the absence of specially built container ships, the only commodities left for Soviet ships in the conferences to transport were small amounts of irregularly scheduled and low-rate cargo unsuitable for containerization.

The experimental use of containers by ships of the Poltava class and Leninsky-Komsomol class was initiated by the Soviet Merchant Marine in the Black Sea in 1967. The use of containers was also developed along the Northern Sea Route during the same year.[40] In spite of using small containers, the Soviet Merchant Marine's volume

[35] M. A. Gnatkov, *op. cit.*, pp. 33–35.
[36] *Vodnyy Transport*, March 16, 1971.
[37] *Ibid.*
[38] Deribas, A. T. *Transportation of Cargo Without Reloading*, Moscow; *Znaniye*, 1970, p. 4.
[39] Deribas, *op. cit.*, p. 6.
[40] *Morskoy Flot*, No. 3, 1968 and No. 11, 1970; *Vodnyy Transport*, February 22, 1973.

of containerized cargo in 1970 reached 600,000 tons.[41] Starting in May 1970, ships of the Baltic line, using Leningrad as one terminal and a suitable European port as another, were carrying 10 and 20 foot ISO standard containers leased from foreign countries.[42] The transit of containers via Trans-Siberian Railway from Europe to Japan has been established, and a regular container line between Nakhodka and Japanese ports was opened in the spring of 1971.[43] Also, during summer of 1971, the container line between Il'ichevsk and Bulgaria was opened.[44] Along the Northern Sea Route and in the Northeastern Regions of Soviet Far East, special self-propelled barges (Sever type, 14-ton cargo capacity and the improved Vostok type, 22-ton cargo capacity) carried aboard ships are used for loading and unloading unitized cargo and containers.[45]

The Central Scientific Research Institute recommended seven new general cargo ships, all of them capable of carrying containers. The proposed new ships are designed to operate as liners and are self sufficient for handling containers. According to the Soviet Minister of Merchant Marine, during the period 1971–1975, container ships will be built with capacities of 40, 200, 300, and 700 20-foot containers. Roll-on/roll-off ships and LASH ships designed to take on board 40–50 lighters of 200–400 tons each are under consideration.[46] The construction of cargo helicopter carriers was also recommended. Among the arguments favoring the construction of such a ship is the frequent necessity for unloading cargo at harbors or points on the shore lacking cargo handling facilities. A converted AMGUEMA-class with three KA–25 K helicopters and a specially designed project No. 567 A cargo ship with three MI–8 helicopters were considered. Increased reliability of loading and unloading operations of those ships was claimed owing to their relative independence of weather conditions.[47]

The first Soviet container ship, Svetlogorsk, built in Vyborg in 1971, can carry 218 containers. East Germany and Poland started to build container ships in late 1970.

Containerization is planned to be introduced in two stages: the first stage, 1971–1975, "organizational-technological preparation," will involve building up a container inventory, the development of a maintenance-repair base, and experience in container utilization. This preparation will parallel the construction of container ships, of which 21 have been authorized.

As of March 1973 the Soviet Merchant Marine had in operation 3 Svetlogorsk-class container ships, a number of universal ships capable of carrying 368 (Varnemyunde-class) and 282 (N. Zhukov-class) containers each. In 1973 six more container ships should be delivered. Several container ships, each 750 containers capacity, were ordered in East Germany. Their delivery is expected prior to the end of 1975. Six ships of roll-on/roll-off type, with capacity from 200 to 1300 containers, were ordered. (2 will be built by domestic yards, 2 in Poland, 1 in Finland and 1 in France.)

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[41] *Morskoy Flot*, No. 1, January 1970; *Ekonomicheskaya Gazeta*, No. 5, January 1973.
[42] *Morskoy Flot*, No. 4, April 1971.
[43] *Pravda*, July 4, 1971.
[44] *Vodnyy Transport*, August 28, 1971.
[45] *Morskoy Flot*, No. 1, 1971.
[46] *Vodnyy Transport*, March 16, 1971.
[47] The proposed cargo helicopter carrier and a containerized or unitized cargo system comprise the major elements of the ship helicopter extended delivery system (SHEDS). In addition, most of the new ships proposed for containerization will be self-sufficient. The two measures would result in extra cost, but are important militarily.

In addition, there is a plan to buy from East Germany an unspecified number of ships carrying 40 containers each (for lines between Germany, Bulgaria, and the U.S.S.R.).

During the second stage, 1976–1980, "containerization will become the main means of transportation for general cargo". The fleet of container ships will be considerably enlarged to include an unspecified number of specialized container ships with a 1,200–1,400 container capacity and a speed of 23–25 knots, 20–30 ships with a 700-container capacity, and 25 ships with a 300-container capacity.

In 1971 a special decree of the Soviet Council of Ministers "On the measures for further development of containerized and packetized transportation of cargo" was issued. In 1975 the Soviet Merchant Marine is supposed to establish 266 container-lines. Additionally, 18 such lines should be established by the river fleet. Moreover, the maritime containerization should be integrated into the container of the country which is supposed to carry 105 million tons in 1975.

Even a partial solution of the containerization problem will improve the situation in the Soviet ports. But most likely, Soviet port facilities will be a major obstacle in a drive to achieve greater efficiency of Merchant Marine for years to come.

D. Shore Facilities

For normal and, even more important, for effective operation, any merchant marine has to have well developed shore facilities, particularly ship repair and port facilities. In general, the development of shore facilities throughout the world lags behind fleet development. There are very few ports which can accommodate super-tankers, and the development of progressive methods such as containerization is restricted by the availability of ports equipped to handle containers. In general, it appears easier to build a fleet to the appropriate size than to develop the necessary shore facilities, particularly ports; the Soviet experience in this respect might be considered typical. Even in the past, when the Soviet Merchant Marine was small, the existing shore facilities did not satisfy the requirements. With the rapid development of the Soviet Merchant Marine, the gap between the shore facilities and size of the fleet widened, not because shore facilities have not been developed, but because the rate of their development has not matched the rate of the fleet growth. Recognizing the problem, the Soviets openly stated that the future profitability of the Merchant Marine should not be bound to the emphasis on increasing its tonnage, but would result from the harmonious development of every branch of the industry. For the near future at least, that harmony can be achieved only through the accelerated development and improvement of ship repair and port facilities.

The Soviet Union started specialization in ship repair just prior to World War II, when all large ship repair yards were subordinated to a special department of the ministry, while smaller ones remained under the control of steamship companies. The situation remained unchanged after the war for over the decade. The three categories of repair, small, medium, and major, continued to be practiced; the rationale for repair was dictated by the need to maintain available tonnage and was not justified by economic validity.

At the beginning of the 1950's, the rehabilitation of existing ship repair yards and construction of new ones increased the production capacity, 2.75 times over that of 1940. During the decade of 1950's the modernization of ship repair yards continued, and a new yard was built in Nakhodka. As a result, in 1960 the capacity of Soviet Merchant Marine repair yards was 3 times greater than in 1950 and 8.2 times greater than in 1940. What appeared to be a phenomenal growth actually bears testimony to how weak the ship repair capability used to be.

In 1959–1961, the research and design institutions of the Merchant Marine with representatives of steamship companies made an extensive analysis of expenditures for ship repair and developed the economic and technological rationale for some types of repair. Optimum periods of service for various types of ships and the approved schedules for allocation and amortization of funds for ship renovation were worked out. In 1961 new regulations concerning ship repair were approved and introduced. Major and medium ship repairs were excluded as economically unsound, and only two types of repairs, a small and large, which differ only in volume of work, were introduced.

In 1957 all ship repair yards were subordinated to steamship companies. Starting in 1962 the development of ship repair facilities were accelerated, and capital investment for 1966–1970 was increased three times over that for the previous period.[48] Two new ship repair yards, one in Il'ichevsk (Black Sea) and the second in Slavyansk (Far East), are presently under construction. When completed in 1972–1973, the Il'ichevsk ship repair yards will be Soviet Union's largest. During the last five-year period, 1966–1970, a number of ship repair yards were modernized, and many were supplied with large floating docks. The above measures, combined with the reduction in number of ship types built and the construction of ships in large series, considerably improved the ship repair situation in the Soviet Merchant Marine. In addition, foreign ship repair facilities, particularly in Poland and East Germany, can be and often are used. Soviet ship repair yards are specializing more and more in the repair of specific types and classes of ships; they are therefore better supplied with parts, still in short supply, and are able to make better use of improved technology. The modular replacement method is being introduced, but owing to a lack of spare parts, it is still not widely applied yet.[49]

The shortage of ship repair facilities forced the Soviets to organize and keep so called ship repair brigades (SRB) aboard the ships which were paid out of ship repair funds. Together with the base technical service (BTO) assigned to the ports, the SRB performed about 15% of the total volume of work necessary to maintain normal operation of ships and to prolong the period between repairs at a ship repair yard. It is planned to increase the BTO services to 22% of such work in 1975 and up to 37% in 1980 after which the SRB will be disestablished.[50]

The one reason the Soviet Merchant Marine is satisfied with the goal of 330 days of ship operating time, compared with 340–350 days in most Western countries, is the still relatively weak ship repair and maintenance capabilities, both of which are slated to be strengthened.

[48] *Morskoy Flot*, No. 10, 1967, pp. 7–14.
[49] *Vodnyy Transport*, July 14, 1970.
[50] *Transactions*, Vol. 133, p. 108.

E. Ports

There are not many natural harbors in the USSR, particularly in the European part. For this reason, most of the Soviet harbors have to be protected by breakwaters. Port facilities were considerably expanded prior to World War II, but neither their locations, with few notable exceptions, nor their cargo handling equipment was good. During World War II more than 70% of the port facilities in the Baltic, the Black Sea, and the Northern Basins were destroyed. Many ports, including such large ones as Tallin, Riga, Nikolayev, Odessa, were left without a single pier or cargo storage facility. The only undamaged ports were in the Caspian Sea and the Far East. For eleven years (1945–1956) most of the funds allocated for ports were spent for restoration, and not until 1956 was a new stage in the development of port facilities initiated.[51]

The highest priorities were given to expanding bulk-cargo handling facilities, the construction of deep-draft piers and approaches, bunkering facilities and wide introduction of mechanized cargo-handling equipment (gantry cranes, fork lifts).

Construction of new ports such as Il'ichevsk, Wrangel' and modernization of existing ones has been underway for years. The Port of Wrangel', about 20 miles from Nakhodka, is being built with Japanese financial and technical assistance. To be completed in 1973, the new port will have 60 piers for deep-draft ships and a total berthing length of 12 kilometers. Special container terminals will be built, and modern cargo transfer equipment installed (for example, the coal terminal will process 12,000 tons of coal per hour).[52] The Port of Nakhodka was gradually built up in the post-World War II period in an area 100 miles southeast of Vladivostok. The port benefits from the Japanese Current, is completely icefree the year round, while Vladivostok sometimes freezes. A special extension of the Trans-Siberian Railroad has been built to Nakhodka.

There are now 8 extra class, 21 first class, 17 second class, and 19 third class ports in the Soviet Union and about 100 small ports. All together, they processed close to 300 million tons of cargo in 1970.[53] However, the construction of new ports and the modernization of existing ones has not been keeping pace with the rapid expansion of the Soviet merchant fleet, and the port facilities have become a major hindrance to the efficient operation of the whole merchant marine.

There is nothing unusual in the present situation; for many years the main attention of the Ministry and its central planning organs had been devoted to developing the fleet and increasing its tonnage. In the ten-year period 1959–1968, capital investment in the fleet exceeded that in ports by more than 7.5 times. While the Soviets have obtained a rather modern and to a large degree diversified fleet, their ports are incapable of serving it properly, and the ships are losing a considerable portion of their operating time in ports waiting to be processed. For example, in 1968, 57% of the total operating time of

[51] *Morskoy Flot*, No. 10, 1967, pp. 7–14
[52] *Trud*, September 22, 1971.
[53] V. Voronkov, *op. cit.*, pp. 35–36.

dry-cargo ships was spent in ports. Besides the low capacity for processing ships there are deficiencies in planned scheduled arrivals of Soviet ships, further increasing the time loss.

A comparison with foreign ports is striking. For example, in 1968 Soviet ships lost 268 ship days in foreign ports waiting to be loaded or unloaded, which constituted 1.6% of all time lost in unproductive waiting. In Soviet ports, they lost 6,341 ship days, or 27.5%, i.e. 24 times as much as in foreign ports. In foreign ports, longshoremen await the arrival of ships, while in Soviet Union ships wait until longshoremen are free to unload them. As a rule, longshoremen in foreign ports work only one shift, while Soviet longshoremen work three shifts, yet according to Soviet calculations the transfer volume in Soviet ports is only 2% higher than in the foreign ports.

There are two major reasons for such low performance: the degree of mechanization in Soviet ports is still below that in foreign ports, and there is a labor shortage. For example, during 1966–1968 the volume of processed cargo in Soviet ports grew by 14.7%, but the mechanical equipment increased only by 1.1% and the number of workers by only 2.8%.[54] This is why at the end of 1970 the Ministry requested a one-third increase in the number of port workers, a request which is unlikely to be satisfied. On the other hand, the Soviet preoccupation with bookkeeping and statistics has produced a huge bureaucracy in the ports, resulting in a situation where there is more managerial and clerical personnel than longshoremen and port workers.[55]

The remedy is seen not in reducing the flow of information and the bureaucracy, but in automation, i.e. introduction of the automated system of control, the ASU. Meanwhile, a delivery of new machinery to a port is accompanied by often unrealistic increase in norms for loading and unloading operations, which in turn increased the fine a port must pay for the time wasted by ships while waiting to be processed. A paradoxical situation is created, where the port administration quite often resists the introduction of new technology, preferring to operate according to established norms.[56]

As stated previously, the problem of disproportionate development of fleet and shore facilities has been recognized, and certain corrective measures, initiated. Already in 1971 the time lost by ships in ports was reduced, in some steamship companies by as much as 60%. But the gap between the cargo carrying capacity of the fleet and the capacity of ports remains a serious problem, particularly in the Far East.

During the current five-year period (1971–1975), it is planned to build more deep-draft berths, particularly in ports handling export-import cargos, to gradually replace most of the general purpose cranes with specialized cargo handling equipment with a high rate of productivity, to improve the scheduled operation of the fleet and to introduce more automatic equipment. Ports are viewed as the main emphasis of the Merchant Marine in its drive to improve productivity.

The greatest expectations of the Soviet planners in realizing this goal lie in the broad introduction of unitized cargo processing systems, particularly containerization. The development of a universal cargo containerization handling system has been called a technical revolu-

[54] *Morskoy Flot*, No. 12, 1970, pp. 11–14.
[55] *Vodnyy Transport*, August 29, 1971.
[56] *Vodnyy Transport*, March 4, 1971.

tion in commercial shipping. Eliminating the traditional pier-side sorting, warehousing, and repackaging of goods, containerization offers vast savings to shippers, tremendously increases the productivity of specialized ships and ports, handling through specialized terminals. The leaders of the Soviet Merchant Marine are well aware of the advantages of containerization, and are planning appropriate measures for its adoption.

IV. Organization and Efficiency of the Soviet Merchant Marine

A. Computer Assisted System for Management of the Soviet Merchant Marine

The Ministry of Merchant Marine is subordinated to and supervised by the Council of Ministers and its agencies. The Ministry activity is coordinated with the Ministry of River Transport, Ministry of Foreign Trade, Ministry of Railroads, Ministery of Shipbuilding, and others.

The Ministry of Merchant Marine is headed by a minister and a number of deputies. To assist the minister, and to provide "collective leadership", there is a collegium consisting of the minister as its chairman, his deputies, and a number of members of the collegium including all the chiefs of the main administrations. The decision of the collegium are put into effect by order of the minister. The minister can overrule the collegium, but it in turn can appeal to the Council of Ministers. There is a relatively clear distinction between staff and line functions. The function of the staff in Moscow is to plan, coordinate, and control. The immediate economic management is mainly in the hands of the basin steamship companies. The Ministry of Merchant Marine is also the agency of state supervision of mercantile navigation in the U.S.S.R.[57] It publishes regulations, instructions, and statutes which are binding on all ministries, departments, and organizations. The U.S.S.R. Registry is within the purview of the Ministry. The most recent changes in the Ministry structure took place in late fall 1970.

The Ministry is now comprised of two main administrations, the Main Administration of Fleet and Port Operations and, the Main Administration of Development and Capital Construction of Ports, Yards, and Shore Facilities and several administrations and departments. The most important is the Main Administration of Fleet and Port Operations, which supervises the operations of 16 Soviet steamship companies through three subordinate administrations.

The Administration of Fleet and Port Operations of the Southern Basin, *Yuzhflot*, supervises the operation of seven steamship companies: Chernomorskoye (Black Sea), Azovskoe (Azov), Novorossiyskoye, Gruzinskoye (Georgian), Dunayskoe (Danube), Kaspiyskoe (Caspian), and Sredneaziatskoye (Middle Asian) Steamship Companies. The Administration of Fleet and Port Operations for the Northwestern Basin, *Sevzapflot*, supervises two northern steamship companies, Severnoye and Murmanskoye, and four Baltic companies, Baltiyskoye (Baltic), Estonskoe (Estonian), Latviyskoye (Latvian),

[57] Article VI, *Soviet Merchant Shipping Code.*

and Litovskoye (Lithuanian). The Administration for Fleet and Port Operations of the Far Eastern Basin, *Dal'flot*, supervises three steam ship companies—Dalnevostochnoye (Far Eastern), Sakhalinskoye (Sakhalin), Kamchatskoye (Kamchatka). The Northeastern Administration of Merchant Marine with headquarters in Tiksi is subordinated directly to the Ministry. The Middle-Asian Steamship Company operates in the Aral Sea and on the Amv Darya River.[58]

During the fall 1970 reorganization of the Ministry, the Scientific-Technical Administration, incorporating the Technological Council, the Department for the Introduction of Advanced Methods of Transportation and Loading and Unloading Operations, the Department For Containerization and the Department for Analysis were established.

Each of the Soviet steamship companies is a large enterprise with a vast area of responsibility, including not only the operation of ships but of ports, ship repair yards, salvage services, etc.

To manage such a huge and complex enterprise as the Soviet Merchant Marine, the central apparatus of the ministry, its main administrations, and the management of the steamship companies are in constant need of receiving and supplying the flow of data concerning the fulfillment of the plan.[59] The need for improvement in the system of control of the Soviet economy was labeled "the main problem of the Party economic policy" in Brezhnev's speech to the 24th Party Congress. Party and government decisions stressed a need for the speediest introduction of a comprehensive system of automated control based on a network of computerized centers as a means of fulfilling the task. The All-Union Automatic Control System (*OGAS—Obschegosudarstevennaya Automaticheskaya Sistema Upravleniya*) will incorporate the automated system of Gosplan, the Central Statistical Administration, the All-Union Supply Administration, the industrial branches, and other centrally subordinated agencies, each having its own system called ASU (*Automatcheskaya Sistema Upravleniya*—automated control system).

All ASU systems are based on a network of computer centers down to the large enterprise level. A number of such computer centers are now in operation. The problem, however, is that the elements of the system introduced earlier were based upon various computers which are in the main obsolescent and incompatible with one other. Moreover, the installed computers utilized non-standard programs. For those two reasons, they cannot be linked together even in the framework of one industry, not to mention of an All-Union system. The Soviet Merchant Marine case represents a typical example.

The Ministry of Merchant Marine, by virtue of its activity and the availability of a relatively well-developed communication system, was among the first where introduction of the automated control system, ASU, was initiated. During 1962–1963 the TsNIIMF (Central Scientific Research Institute of Merchant Marine) worked out computer programs for the organization of cargo movement, distribution of ships on lines, and the optimum fleet development. Since 1964 the optimum lines schedule has been controlled with the use of the Minsk-22 Computer.[60] In 1965 an experimental Calculating Computerized

[58] *Vodnyy Transport*, September 15, 1970, and *Morskoy Flot*, No. 11, 1970.
[59] V. G. Bakayev, *op. cit.*, pp. 22–23.
[60] TsNIIMF *Transactions*, Vol., 133, 1970, pp. 45–97.

Center was organized in the Baltic Steamship Company, followed in 1968 by two centers at the Black Sea Steamship Company and the Far Eastern Steamship Company. In 1966 the Main Computerized Calculating Center of the Ministry of Merchant Marine was organized.[61] The center's task has been to control both the routing of ships and the flow of cargo and to plan and regulate the operation of ships and ports, in cooperation with steamship company centers, whose introduction into service and operation the main center is supposed to coordinate.

The ASU of the Ministry of Merchant Marine, "Morflot", approved in April 1970, is supposed to be developed on the basis of existing computer centers utilizing a third generation of computers. The scope of the system can be illustrated by the outline of functions the system is to perform. Each function is tied to a corresponding sub-system, as follows:

(1) "Operational Control of Fleet (ships) location";
(2) "Operational Control of Cargo Transportation Process";
(3) "Operational Planning, Control of Fleet and Port Operations";
(4) "Current Planning of Basic Activity of Merchant Marine" (automates preparation of annual plans and economic calculations);
(5) "Charter" (Automates flow of information concerning the charter market situation, analyzes the economic effectiveness of charter transactions, determines optimum ship requirement);
(6) "Technical Control of Fleet Condition, Ship Repair Plans, and Implementation";
(7) "Supply Planning and Stocktaking";
(8) "Bookkeeping and Statistical Calculations, Economic Analysis";
(9) "Personnel". The ASU's of steamship companies, ports, and large ship repair yards are to have similar appropriate sub-systems. A unified system of documentation based upon computerized data processing is also under development. Those are the basic features of the planned unified automated system of merchant marine control.[62]

The development of ASU Morflot has already been associated with a number of problems. The computers installed during the rush to create more computer centers in steam ship companies are of various designs, and many of them do not meet the demands of the system. There is lack of program standardization among steamship companies, and the existing and presently utilized programs do not always correspond to the design of the subsystems of ASU Morflot and hence have to be modified and adjusted to the central system. The system design was criticized for its complexity and the excess of information flow it requires, which presumably "would overload the system".[63]

B. Personnel Policy, Educational and Research Institutes

In the course of developing a merchant marine, any country faces two immediate problems: procuring ships and manning them. While the first problem can be solved during a relatively short period of time by building ships and buying them, the second requires a considerably greater period of time, for it takes years and even decades to educate an appropriate number of specialists and to gain experience.

[61] *Transactions*, p. 99, and *Morskoy Flot*, No. 11, 1967, p. 14.
[62] V. Voronkov, pp. 27–31.
[63] *Vodnyy Transport*, September 14, 1971.

Pre-Revolutionary Russia had two maritime academies and nine nautical schools. After the Revolution, the nautical schools were transferred into specialized secondary educational establishments, and two higher institutes to train engineers for water transport were opened, one in Leningrad and another in Odessa. Leading personnel of steamship companies and other merchant marine enterprises were trained in the Academy of Water Transport. Drastic educational reform for the Soviet Merchant Marine was introduced on March 5, 1944 by a Decree of the State Committee for Defense on measures concerning the training of command cadres of the mercantile fleet". Higher engineering education for ship's officers was introduced. Educational institutions of the merchant marine were enlarged and upgraded. The decision was said to be motivated by the considerable losses of personnel during the war, and the planned expansion of the Soviet Merchant Marine. Three higher merchant marine academies, Leningrad, Odessa, and Far Eastern, were organized in addition to twelve nautical and one Arctic school. In Soviet specialized literature, the decision has always been referred as historic.[64] During the post-World War II period, the number, and particularly the size, of merchant marine educational institutions increased. In 1945 the Higher Arctic Nautical School was organized. In 1954 the Arctic School was merged with the Leningrad Higher Maritime Academy into the S. O. Makorov Leningrad Higher Engineering Nautical School (Academy), the largest Soviet Merchant Marine educational institution.

At present there are four higher and twelve specialized secondary educational establishments, administered by the Ministry of Merchant Marine, engaged in training officers for an engineer diploma in fourteen specialities and a technician diploma in ten specialities.[65] In addition to the Leningrad Higher School, there are three more, the Admiral G. I. Navel'skoy Far Eastern Higher Engineering Nautical School; the Odessa Higher Engineering Nautical School; and the Odessa Engineering Institute of Merchant Marine. The four have a combined total of 5,000 full-time cadets and more than 4,000 correspondence courses and part-time students. In addition, three institutes are training engineers for shore services, and some of them, such as the Gor'kiy Engineering Institute of Water Transport, have departments for training ship officers. All higher schools have a period of training of not less than five years. Secondary specialized nautical schools have a period of training of from three years to four years and three months.[66] The post-graduate training is provided by higher schools and two merchant marine scientific research institutes. Most of the graduates pursue full-time study.

The education is free, and the cadets receive allowances, uniform, and free board. But there are also part-time study arrangements with extended period of training, and correspondence courses. Many sailors (unlicensed and sub-officer seamen) study at both higher and secondary nautical schools by correspondence. Such studies are encouraged. The educational institutions occasionally send instructors to serve on ships on long voyages to help correspondence-course students, and in large ports, special student consultation centers have been set up. Stu-

[64] *Morskoy Flot*, No. 3, 1969, p. 34; No. 10, 1967, pp. 7–14; and *Vodnyy Transport*, March 13, 1969.
[65] *Morskoy Flot*, No. 3, 1971, pp. 3–7, and *Soviet Military Review*, No. 6, 1970, pp. 8–9.
[66] *Vodnyy Transport*, May 26, 1970, and May 25, 1971.

dents in correspondence courses are given additional paid leave for a period of 20–40 days a year to prepare for and to take examinations. Approximately one-third of the Soviet seamen are involved in studies at the higher or secondary educational level. The number of seaman correspondence-course and part-time students studying in just the educational institutions of the merchant marine reached 28,000 in the 1968–1969 school year.

Cadets in higher and secondary nautical schools receive good sea practice, which starts on sailing ships, and continues on special training ships assigned to the schools. In 1970, the training fleet of the Soviet Merchant Marine consisted of 15 ships, and has been growing since. A large series of B–80 training ships (the Soviets call them "training-cargo ships", for they can and do transport cargo) has been under construction. The original order for 3 ships from Poland was augmented in 1970 to a total number of 10.[67] Senior cadets are receiving practice aboard operational ships of the Merchant Marine.

During the 1966–1970 period, 32,179 engineers and technicians were trained, and 8,150 specialists improved their qualifications in the merchant marine educational system.[68] The ship's officers of the Soviet Merchant Marine are relatively young. At the end of 1969 there were 1,600 licensed captains, of whom 800 were between 31 and 40 years old, 750 between 41 and 60 years old, and about 40, more than 60 years old.

The captains were distributed as follows by nationality: 1,100 Russians, about 200 Ukrainians, 32 Georgians, 32 Jews, 23 Azerbaijanis.[69] The Soviet Merchant Marine even has several women officers, and at least three of them have been masters, actually commanding ships. Of 1,600 Soviet licensed captains, about 700 have higher education. On an average, in the Soviet Merchant Marine it takes eight years for a graduate from a higher nautical school and ten years for a graduate from a secondary specialized nautical school to become a captain.[70] It is openly admitted that graduates from secondary nautical schools have had a progressively growing feeling of a lack of education, and many for this reason continue in higher nautical schools by correspondence.

During the 1971–1975 period it is planned to increase enrollment in the educational institutions of the Merchant Marine. Existing higher nautical schools in Odessa and Leningrad are being expanded, and the decision was made to organize a new school, the Novorossiysk Higher Engineering Nautical School.[71]

Apparently there is no lack of young men who desire to enroll in nautical schools and become merchant marine officers. In 1971 there were from 3 to 5 applications (varying from school to school) for each of the 10,000 openings available in higher and secondary specialized merchant marine nautical schools. In the Odessa Higher School there were 2,000 applications for 500 openings. In the Kherson Secondary Specialized School there were 1,200 applicants for 90 openings in the command department. Thus, there is neither a shortage of applicants for merchant marine nautical schools nor a notice-

[67] *Morskoy Flot*, No. 3, 1971, pp. 3–7; No. 11, 1971, p. 62.
[68] *Morskoy Flot*, No. 11, 1971, p. 63.
[69] *Nedelya*, No. 50, December 1969, p. 18.
[70] *Morskoy Flot*, No. 11, 1970, pp. 44–45.
[71] A. V. Voronkov, p. 47.

able shortage of basic specialists required by the merchant marine, and hence, the system of specialists training in the Soviet Merchant Marine appears to be fulfilling its basic task.

In addition to their educational role, the Soviet nautical schools, particularly at the higher level, are involved in extensive research work. But the bulk of research work for the Soviet Merchant Marine is conducted by two very large institutes, the Central Scientific Research Institute of Merchant Marine in Leningrad (TsNIIMF), with branches in the Far East, Baku, and Murmansk, and the State Design and Scientific Research Institute of Merchant Marine in Moscow (Soyuzmorniiproekt), organized in 1960, with branches in Leningrad, Odessa, and Vladivostok.

The scope of the work of the two research institutes is so broad that there is hardly any topic or aspect related to the merchant marine which it does not cover. There are several hundred research specialists in each institute.

It is difficult to draw a clear demarcation line between the specialties of the two institutes, for they have both in a number of instances been involved in research dealing with the same subject. For example, both have conducted research on unitization and containerization of cargo or standardization of ship designs. However, the TsNIIMF is primarily concerned with the mercantile fleet, its ships, and problems associated with them. The Soyuzmorniiproekt, on the other hand, is concerned with the economic performance of the entire merchant marine, particularly over the long range, and on the technological side, with shore facilities such as ports, repair yards, and systems of cargo handling. Any given problem is usually handled by one department of either institute. The research findings and proposed solution for the problem are reported to the Scientific Council of an institute which, after approval, sends the recommendations to the Ministry for practical application. During the past several years, both institutes have produced a number of recommendations, including those dealing with the automation of ships and management control of the Ministry, which were accepted and have either been or are being implemented.

There are fifteen nautical schools training unlicensed and sub-officer seamen with a period of study of about one year. These schools and a number of special courses from a few weeks to 3–4 months in length supply the Soviet Merchant Marine with a pool of qualified personnel. Many sailors and officers upon completion of their service in the Soviet Navy, as well as naval officers separated from the Navy for various reasons often join the Merchant Marine, and thus increase the pool of qualified personnel. The romanticism of sea duty, a degree of adventurism so common to the young, good pay (better than for shore duty), and the possibility for advancement through education are but a few of the factors attracting many Soviet young men to service in the Merchant Marine. Soviet restriction on travel abroad is also a definite factor in making sea duty attractive.

A system of material incentives is widely applied in the Soviet Merchant Marine. In addition to free food, for which 39–49 rubles per month, depending upon area of operation, is allocated,[72] uniforms, better housing for families ashore, and a network of kindergartens and

[72] A. V. Voronkov, p. 29.

nurseries operated by the Merchant Marine, seamen are paid bonuses for the successful fulfillment of plans and are provided with rest and recreation stays at health and rest homes. More than 150 hospitals and 170 polyclinics are run by the Merchant Marine Ministry,[73] which employs more than 5.5 thousand doctors. New Soviet ships, which are in the majority, have comfortable cabins for the crew and good recreational facilities, including swimming pools in many ships.

Practically all large Soviet ports have seamen clubs and some have hotels where families of seamen can stay on visits to the ports. The Ministry schedules regular radio programs "for sea-farers", with good music and prescribed news and propaganda and so called "radio letters" from relatives of the seamen. Each ship has its own amateur musical and singing groups, and some ships have orchestras. Athletic team are formed from among the crew members. All these groups and teams do not limit their activity to entertainment alone, which certainly is a factor, but they perform while visiting foreign ports and also participate in sports competitions with their hosts. This so called "cultural and sport activity" of the crews is closely supervised and directed to produce a favorable effect upon foreigners.

The system of "political organs" in the Soviet Merchant Marine, which at the ship level includes the Pompolit (Political assistant to the captain) and Party and Komsomol (Young Communist League) organizations, is responsible for the organization and maintenance of such activity. Ship captains, most of whom, together with the senior ship officers, are members of the Communist party, have to support that activity and probably find it beneficial to the morale of the crew.

Propaganda and political education, regularly conducted among crew, are designed not only to indoctrinate sailors in Soviet Communist ideology but to make them effective representatives abroad. That obligation of Soviet crew members is openly proclaimed in the Soviet Merchant Marine, and crews of Soviet ships are constantly reminded of it. There are now more than 1,250 Soviet crews which are "collective members of Soviet societies of friendship and cultural ties" with people in foreign countries. Thus, one more form of "profitable" employment has been found for the Soviet Merchant Marine.

C. Economic Efficiency of the Soviet Merchant Marine

In spite of the apparent similarities between the operations of the Soviet Merchant Marine and the merchant marine of any other maritime nation, it is an extremely difficult task to compare their performance in economic terms. Such basic categories as ownership and the objectives of operation differs drastically from those of Western merchant marines. Centralized planning and control and the rationale of fleet utilization in the Soviet Merchant Marine also differ markedly from Western practices. According to D. Fairhall "some factors are declared to be more rational than others and the nature of the criteria applied to the planning might have very little in common with the familiar Western criteria".[74] What is implied here is the possibility of using the Soviet Merchant Marine to achieve purely political and military objectives, as certainly might be, and occasionally has been,

[73] *Morskoy Flot*, No. 8, 1970, p. 12.
[74] See D. Fairhall, *op. cit.*, pp. 111–114.

the case. As for the political purpose, the Soviets themselves do not deny the importance of using their merchant marine to that end. Moreover, the Soviet Merchant Marine is considered to be a part of a unified internal transportation system, and as such its performance and utilization, if measured against the interests of the overall system, do not necessarily coincide wtih Western standards of efficiency. In spite of the recent Soviet emphasis upon profit, profitability, and the introduction of cost accounting in every enterprise, an examination of current Soviet Merchant Marine statistics, reveals a continued emphasis on cargo turnover, ton-miles, cargo processed, and cargo capacity.

On the other hand, allowing for such peculiarities of Soviet Merchant Marine operations, it is still necessary to recognize the existence of a pragmatic understanding of its economic function by the Soviets. In addition to its satisfying the Soviet Union's shipping requirements, "liberating the Soviet Union from dependence upon the capitalistic charter market", and assisting in the development of Soviet foreign trade, there is a genuine drive toward greater efficiency which in essence does not differ much from that in any other merchant marine in the world. The Soviets are trying to increase the productivity of their ships, ports, and ship repair yards, improve ship design, select better propulsion units, install more productive cargo handling devices, introduce automation, and reduce the administrative apparatus. Occasional rate cutting, either to gain competitive advantages or to avoid returning empty, is not unique to the Soviet Merchant Marine, and has a long history in world maritime practice.

The economic reform, "the new system of planning (management) and incentives", launched in September 1965 was gradually introduced into the Soviet Merchant Marine during the period 1966–1968. First established in a number of pilot enterprises, a Latvian steamship company, the Port of Riga, a ship repair yard in 1966 and a Murmansk steamship company in 1967, the reform gained momentum, and in 1968 the Ministry of Merchant Marine completed the conversion of all its enterprises to the new system.[75] The introduction of the reform resulted in a greater degree of enterprise independence from central control and permitted wider application of efficient methods of management. Profit and profitability were applied as standards for measuring the performance of ships, ports, and steamship companies.[76]

The reform did not grant the enterprises complete control over the distribution of profit, and the portion left to the industries varied. As for the Merchant Marine, 84.8% of the 1966 profit was left to the Ministry, of which over 70% was reinvested.[77] Planning and measuring of merchant fleet performance in foreign runs in terms of profit was introduced even before the reform, and high profitability of operations has been claimed. The announced rate of return was 18.5% for 1968, 13.2% for 1967, 4.9% for 1960, and 3.7% for 1958.[78]

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[75] *Communist of Armed Forces*, No. 21, November 1969, p. 47.

[76] It has been constantly emphasized in the Soviet Union that the Socialist state is not at all indifferent to how an enterprise obtained a high profit. Not denying at all the concept of profit, many Soviet economists emphasized, however, that the high profit can be obtained "only through high prices" (which, in fact, is a "general law" stated by Marx). Party directives did not demand either the maximization of the profit or the raising of prices. Increased labor productivity and the reduction of production costs have been stressed as the main goals.

[77] *Morskoy Flot*, No. 6, 1968, p. 35.

[78] *Communist of Armed Forces*, No. 21, November 1969, p. 48.

In 1969 Minister of Merchant Marine Bakayev claimed that the Soviet steamship companies' profits could be the envy of "any ship company" in the world, that the profit covers not only operational expenses but capital investment for future development as well, and that in 1968 there was a net profit of 300 million rubles.[79] How much of the 300 million rubles was earned by charter and how much by Soviet coastal shipping is not clear.

Bakayev became a strong advocate of a more rational planning approach and further reduction and simplification of a system of indexes, at least in relation to the Merchant Marine. He emphasized the peculiar character of the industry's operation, the need for a greater sense of responsibility toward customers, and broader application of the incentives provided by the reform on the basis of a more rational establishment of funds for this purpose. He also argued for better coordination of plans between the Merchant Marine and its major clients, and the need for the party responsible for a delay to bear material responsibility for it. The Minister emphasized the need to use only one index, profitability, which, he maintained, is more objective and completely indicative of efficiency in the shipping companies. The decisive influence on profit growth of the rate of fleet expansion was used to justify the profit deficiency as an index. Profitability, on the other hand, cannot be changed unless the operation of the fleet is improved.[80]

The Minister was also against the application to the Merchant Marine of group norms which are established for all Soviet industries and which determine the economic incentive funds. There is a lack of uniformity among the various Soviet steamship companies which is caused by specialization according to such factors as geographical location (influencing navigation and fleet composition), which is in turn usually linked to different wage levels, material and fuel costs, the prevailing cargo, types of ships, and types of service, i.e. coastal or foreign shipping, etc. For example, even two companies, Murmansk and Severnoye, operating from the same northern basin are different. The average ship of the Murmansk Company is 30% larger, the average distance to carry a ton of freight is 40% further, and the average wage for workers is more than one and one half times higher.[81] The importance attached to the Soviet Merchant Marine has been acknowledged, and the majority of requests of the Ministry were satisfied.

In comparison with wages in other Soviet industries, Soviet seamen are well paid. In addition to wages and longevity bonuses, there is a system of incentive bonuses determined by the performance of the ship and contribution of the crew to it. In the fall of 1971 a very important regulation for rewarding ships operating at reduced manning levels was approved by the Council of Ministers of the USSR. The experiment to man ships at a reduced level (crew strength has often been in excess of the actual need) was initiated in 1969, and it produced a very favorable result: productivity was increased by 11%. The main reason for such a phenomenon was purely materialistic, for the remaining crew members were paid better. All the wages of the relieved members in rubles and 50% in foreign currency (crews on

[79] *Ibid.*, p. 49.
[80] The profitability is calculated as the ratio of profits to fixed and working capital.
[81] *Ekonomicheskaya Gazeta*, No. 25. June 1968, p. 5.

foreign runs are paid in both Soviet and foreign currencies) were left for distribution among the remaining crew members. As a result, the average wage on such ships increased by 22% and crew costs dropped by 11.5%.[82]

The approved regulations not only sanctioned operations with reduced crews (subject to approval by the Minister, and providing that the safety of navigation is not being compromised), but even improved the system of material rewards for the crew paid for by the saved funds.

The 1971–1975 plan projects a 24% increase in labor productivity on ships, 12% in cargo handling operations, and 35% in ship repair. It is planned to reduce crew by 20% and in the more remote future by up to 50%.[83]

Party control of the unions, the practical absence of unemployment, and the shortage of labor produced a situation where the workers not only permit, but welcome, the introduction of any labor-saving devices. Surprisingly enough, it is the local administration which tries to resist and avoid the introduction of such devices, because of unrealistic increases in the norms and indices often accompany them.

Compared with other modes of Soviet transport, the cost of transportation in sea and river fleets appears to be low.

TABLE 6.—PRODUCTION COST OF BASIC SOVIET TRANSPORT TYPES

[Kopek per 10 ton-kilometer]

Type	1960	1965	1970
Railroad	2.76	2.40	2.34
Merchant marine	1.92	1.38	1.46
River fleet	2.53	2.38	2.45
Auto (trucks)	64.15	61.11	57.13

Source: L. P. Chertkov, "To Increase Efficiency of Transportation", Znaniye, Moscow 1972, 64 pages.

According to Soviet statistical practice, profit, in relation to a ruble invested in fixed assets of Merchant Marine, had been rather substantial: 7.2 percent in 1965, 13.6 percent in 1967, 18.5 percent in 1968, and 17.2 percent in 1970.

The contribution by the Soviet Merchant Marine to the country's balance of payments, particularly through saving hard-currency in transportation of foreign trade cargo and earning it by charter, has been important. This factor alone appears to justify the expansion of the Soviet Merchant Marine.

V. Fishing

Starting in 1947, the Soviets built a series of medium trawlers (SRT) for side trawling and for use of drift nets. In the late 1940's the pre-World War II catch level was achieved. The greatest portion of the catch was obtained from internal waters (rivers, lakes) and close, off-shore, waters of the adjoining seas.

The turning point occurred about 1950, after which there was an accelerated development of high sea fishing, resulting in steadily growing catches. Restoration of the war-damaged industry and achievement of pre-war level of production together with growing

[82] *Morskoy Flot*, No. 8, 1970, and *Ekonomicheskaya Gazeta*, No. 39, September 1971, p. 7.
[83] *Vodnyy Transport*, October 5, 1971.

shipbuilding capacities in East Germany and Poland assured rapid build-up of the fishing fleet.[84]

It was well known in the Soviet Union that for the same amount of protein, fish product requires considerably less capital investment than that needed for meat products. It was also recognized that in order to achieve a large increase in the Soviet catch, the high seas fishing operations would have to be expanded. To be efficient, those operations required a special fishing fleet consisting not only of trawlers, but mother ships, factory ships, refrigerator-transports, and support ships such as tankers, tugs, etc. A number of such ships were built in the second half of 1950's in Soviet and foreign yards.

The Soviet fishing fleet appeared for the first time in the Northwest Atlantic near Newfoundland in 1956 and later on the Western Edge of George's Bank. A similar development took place in the Soviet Far East. These efforts resulted in the steadily growing Soviet catch: 1950—1,627,000 tons; 1955—2,495,000 tons; 1960—3,051,000 tons.[85]

The experience of operations in remote fishing grounds convinced Soviet specialists that larger trawlers with refrigerating or freezing facilities were needed to improve the efficiency of the fishing operations. Also, the absence of overseas bases and the remoteness of fishing areas forced the Soviets to develop methods for processing the catch on the fishing grounds. The decade of the 1960's witnessed a steady increase in the size and capability of Soviet trawlers and the development of the auxiliary fleet that was capable not only of supporting a large group of such trawlers for months, thousands of miles away from the Soviet shores, but also of processing the fish afloat.

Soviet domestic yards continued to build medium trawlers, but their size was doubled compared to those built in the 1950's; all of them have either refrigerating or freezing facilities. In 1963 the Soviet Union started to build two classes of trawlers, the Mayak and the Pioner. Both trawlers have a displacement of over 900 tons. In 1967–1969 two more classes of trawlers, the Ol'ga and Sargassa, were built, both with a displacement of around 1,000 tons. All four classes are capable of using a variety of fishing equipment such as drift and seine nets, trolls, and purse seines. At the end of the 1960's the first series of Soviet stern trawlers was built.[86] The Sudoimport Agency ordered hundreds of vessels abroad. In the early 1960's a series of over eighty Soviet-designed Tropik-class stern-slip freezer trawlers were built by East Germany. This was followed by the Atlantic-class stern trawler, successor to the Tropik, also built in large series. Both classes of ships are equipped with sophisticated hydroacoustical gear for fish detection, in both the horizontal and the vertical planes.[87]

A Polish yard built a large series of Mayakovskii-class stern trawlers under Code B–26, designed and originally built by the Soviet Union.

In addition to freezing and refrigerating equipment, the trawlers have fish processing plants. On the fishing grounds, the trawlers are supported by factory-mother ships equipped with processing lines and

[84] Increasing capability of the East European countries to build ships, particularly fishing vessels, was very important for the Soviet Union because its own shipbuilding industry, though mainly restored and even growing, was busy fulfilling orders of an extensive naval shipbuilding program, initiated in 1947.

[85] *Sudostroyeniye*, No. 12, 1969.

[86] *Sudostroyeniye*, No. 12, 1969.

[87] For a detailed description of these fishing trawlers, see *U.S. Naval Institute Proceedings*, November 1970.

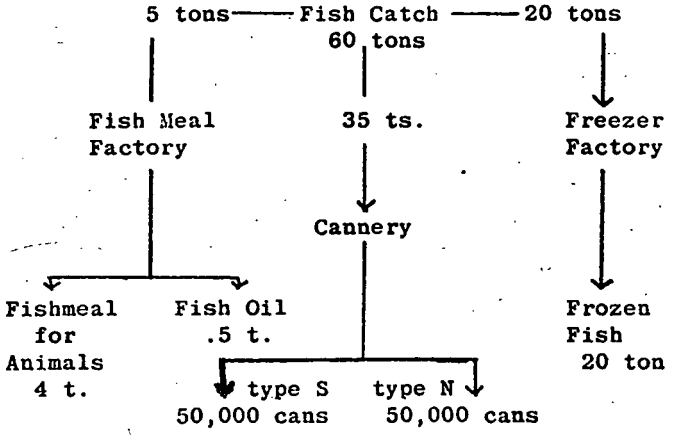
refrigerated storage and able to supply the trawlers with food, fuel, water, and medical and recreational facilities for its crews.

Typical of the factory-mother ships is the Zakharov-class which displaces 16,400 tons, has facilities for canning and freezing fish and producing fish meal for animal and plant food. She is capable of receiving fresh, chilled or frozen catches simultaneous from up to eight fishing vessels, moored alongside. Another class of mother ships, the Severodvinsk, built in series by the Polish yards since 1955 (under modifications coded B–62 and B–64), is used as a mother ship for 20–30 trawlers. Construction of a more advanced class of mother ships, the Professor Baranov, in a Polish yard under Code B–69, started in late 1967. Displacing 10,000 dwt, the ship has a fifty percent greater capacity than previous series, with twenty fewer men in the crew because of the high degree of the automation. Her processing plant is capable of preserving about 200,000 cans of fish per day in addition to packaging and processing fish paste and fish meal. Together with attached trawlers, she can operate at sea up to nine months.[88]

The fish transports also have fish processing lines and refrigerated storage and, in addition, deliver turn-around crews for fishing trawlers. Typical of such transports are the Bratsk-class with a 2,500-ton displacement and the Pervomaisk and Sevastopol classes, both displacing 5,000 tons.

The next step in sophistication in fishing methods and operations introduced into the Soviet fishing industry was the combination stern trawler-factory ship, Nataliya Kov'shova. Built by France as the lead ship in a series, she was the largest trawler in the world, with a very sophisticated production plant. The cannery is equipped with the PTU–100 Soviet-built industrial television system. She can remain at sea without replenishment for 120 days in independent operations.

Table 7



Source: Sudostroyeniye No. 9, 1969.

[88] *U.S. Naval Institute Proceedings*, March 1971.

All these measures brought about a considerable increase in the Soviet catch, which reached 6,030,000 tons in 1966. The Soviet high seas fishing fleet, the so called Expedition Fishing Fleet, in 1966 accounted for more than 90% of the total Soviet fish catch. Forty-five per cent of all the Soviet fishing industry catch was processed afloat.[89] The Soviet emphasis on the larger trawlers and self-sustained fishing fleets paid off. When operating near the Soviet shore, e.g. the Barents Sea, one of the best Soviet trawlers would bring in one and one-half tons of fish per casting, while in the Atlantic a casting brings in fifteen or twenty tons. Therefore, the big trawlers could make a profit even if the trip to and from the fishing grounds takes a month, and costing from 2 to 2.5 million rubles to build were amortized in 2.5 years.[90]

The Twenty-Third Party Congress in April 1966 endorsed the recommendations to increase Soviet efforts in developing the fishing industry, and increased appropriations to that end by eighty-four per cent for the period 1966–1970. This direction taken was toward more sophisticated and more specialized ships.

In August 1968, the Soviet Union was host to the International Fishing Industry Fair, Inrybprom–68, held in Leningrad, in which twenty-two countries, including the U.S.A., England, all the European countries, and Japan participated. Soviet participation in the fair was very extensive. Twenty-five ministries and directorates, more than fifty scientific research institutes and about 150 enterprises were represented. The Soviets exhibited ten fishing ships, including the fish factory Uborevich whose automated processing lines are capable of producing 300,000 cans per day.[91]

The Soviet search for more efficient and productive ships in the 1960's resulted in the building of the first catamaran fishing trawler, Eksperiment. The specially designed fishery system for Eksperiment has permitted combining two kinds of fishing, seining and trawling; one of the trawls can be used constantly. While the ship is only 130 feet long, it has a beam of seventy feet, which gives an unusually large deck for its size, and permits a large working area for its crew of twenty-five. The extensive tests not only met, but exceeded, the design specifications, and the decision was made to have a special shipyard in one of the Baltic Republics to specialize in the construction of catamaran vessels.[92]

In 1969 the largest fishing ship in the world with a displacement of over 43,000 tons was launched in the Soviet Union. The Vostok factory ship combines in it the characteristics of at least five types of ship: dry cargo ship, with a storage capacity of over 13,000 tons; a fish factory ship, with the capacity to process 300 tons of raw materials, including the production of 150,000 cans and 180 tons of frozen fish, fishmeal and industrial oil; a passenger ship with a capacity of over 600; a tanker, and a refrigerator ship. She is able to spend four months in tropical waters without replenishment. But the most unique feature of the Vostok factory ship is the fourteen Nadezhda-class fishing boats carried aboard. The Nadezhda-class fishing boat displaces around sixty tons, and its hull is made of plastic. They can be deployed from a mother ship to their fishing stations and, while fishing, are supported

[89] *Morskoy Flot*, No. 7, 1967.
[90] *Soviet Life*, April 1966, and *Morskoy Flot*, No. 7, 1967.
[91] *Sudostroyeniye*, No. 11, 1968.
[92] *Nedelya*, No. 9, March 1969, p. 21.

by a helicopter from aboard the Vostok. The Vostok is capable of independent as well as expeditionary fishing in the most remote areas of the world oceans.

At the end of 1960's, the Soviets also increased the depth of the trawling. During the 1950s and the beginning of the 1960s, the trawling was being done to depths of 200–400 meters. In 1969 one-thousand-meter depths were fished, and the tendency since has been to ever greater depths. For this purpose a special large refrigerator trawler, the Meridian-class, was designed. A more powerful propulsion plant drives the ship at a speed of six knots while trawling, and the trawl depth is increased to 1,200–1,500 meters.[93] The Meridian-class was followed by a number of super trawlers. The first, 8,000 tons Gorizont-class, has an underway speed of fifteen knots, is equipped with the processing plant producing thirty-five tons of fish per day, including twelve tons of fillet, 2,000 cans, and fish meal. Another super trawler, the Prometei, is designed for service in the tropics, while a third, the Barentsevo More, in northern waters.[94] According to the 1971–1975 plan, Soviet fishermen are to fish to depths of 5,000 meters, and the corresponding fishing vessels and equipment are being planned.[95]

A number of small and medium fishing trawlers for fishing in closed seas, such as the Baltic and the Black Seas, and specialized shrimp trawlers have been designed and built. The increase in the trawler fleet has been accompanied by a corresponding increase and sophistication in fish processing factories and refrigerated transports. The fish factory, Korablestroitel' Klopotov, has a fish processing plant with a seventy-four percent higher productivity than that on the Zakharov-class. Displacing 15,300 tons, the ship has a crew of only 120, thanks to the high degree of automation. The ship is designed to operate only in northern and temperate latitudes. For work in tropics and equatorial waters, another ship, the Khabarov, displacing 22,600 tons, was built. The ship production plan is designed for specializing in expensive fish and producing high-quality canned fish. To satisfy the growing Soviet need for fish meal, a series of Pos'et-class fish processing factories is being built. Displacing 28,200 tons, the Pos'et is equipped with special submersible fish pumps, and is capable of receiving up to 800 tons of fish per day from the trawlers. Its plant turns out 120 tons of fish meal per day in addition to other varieties of fish products, including fillets and cans.[96]

A series of twelve 12,500 dwt refrigerated transports has been ordered and is under construction in France. The ship has a very powerful refrigeration plant providing a temperature of minus 30°C and a powerful propulsion system which drives the ship at a speed of nineteen knots. Some of the ships of the series, which have already been constructed, are planned to be used on the Soviet Far East-Black Sea line to deliver fish products to the European part of the Soviet Union.[97] A series of refrigerated transports, the Karl Liebnekht class, is being built in East Germany for service in the Soviet Northern Basin.[98]

The world-wide extension of fishing by the Soviet Union through the so-called expeditionary method, which employs large fishing flotil-

[93] *Sudostroyeniye*, No. 12, 1969.
[94] *Leningradskaya Pravda*, April 30, 1971.
[95] *Nedelya*, No. 28, July 5–11, 1971.
[96] *Sudostroyeniye*, No. 12, 1969.
[97] *Vodnyy Transport*, July 8, 1971, and November 24, 1970.
[98] *Vodnyy Transport*, February 18, 1971.

las centered around and supported by factory mother ships, considerably reduces the unit cost of sea food by processing the catches afloat. Besides the obvious economic advantages, self-sufficient flotilla operations represent the most logical solution to the geographic problems. The Soviet Union has no overseas bases from which fishing operations can be conducted.[99]

The operations of a large fishing flotilla resembles the operation of a large naval fleet headed by the commander (chief of the expedition) and divided into formations (flotillas) each headed by its own commander.[100]

The operations of each expedition and fishing flotilla are controlled from Moscow, where the main information center of the fishing industry not only has the location of each fishing vessel, but collects and analyzes the amount and qualities of the catches and, hence, the effectiveness of the operations. The center was described as follows: "Behind the panels of computers there is a huge operational map of the fishing fleet. The information showed that in the distant waters there were 1,929 Soviet fishing ships, of which 1,420 were fishing, 103 were underway (to or from fishing areas) and 149 were in ports." [101] Their catches for a day, a week, and from the beginning of the fishing cruise, as well as loads including fish, fuel, and other supplies, were known. The center resembles the work of an operations department of a naval staff.

In 1970, 7.2 million tons of fish was caught in the seas and the oceans (not counting the catch in the internal waters), an increase of close to fifty percent over 1965. The growth of the Soviet Fishing Fleet and its technological sophistication obviously contributed greatly to such a catch. However, the achievement would not have been possible without the tremendous research effort.

The future development of the fishing industry during 1971–1975 is planned along the following lines:

more complete and rational mastery of the world ocean wealth and intensified fishing in inland basins will be undertaken;

the 1975 fish catch is planned to reach 10.3 million tons, representing a growth of forty-seven per cent over 1970;

Soviet per capita consumption of fishery produce is planned to reach twenty-three kilogram per year;

the main attention and primary fund allocation will be to further development of ocean fishing, but considerable development of inland fishing is planned as well;

special attention will be paid to the development of fishing farms on ponds and lakes, with production of 2.5 to 3 tons of per fish hectare of water;

it is planned to build and reconstruct forty-three fish-growing enterprises with an annual production in 1975 of 150 million

[99] During the decade of the 1960's Soviet efforts resulted in an agreement with Spain to use a port in the Canary Islands as an overseas operating base. Cuba can be mentioned as a second such place. A number of countries such as Nigeria and Mauritius, provide the Soviet fishing fleets with the right to make port calls, where some minor repairs can be performed. But, in general, those are rather minor exceptions compared with the magnitude of Soviet fishing expeditions, some of which involve up to several hundred vessels in a given area.

[100] *Sotsialisticheskaya Industriya,* December 17, 1970, and January 27, 28, and 29, 1971.

[101] *Sovetskaya Rossiya,* May 19, 1971.

sturgeon, up to 850 million salmon, and up to nine billion other young fish;

more than 900 new ships for the fishing industry will be built in Soviet shipyards and ordered from East Germany, Poland, Denmark, West Germany, France, and other countries;

the designs of all basic types of fishing ships operating in the high seas will be changed.[102]

The main design organization of the Soviet fishing industry, Central Design Bureau, Morpromsud, in Leningrad, is already working on the design of ships for the next Five-Year Plan, 1975–1980, including a specialized fish meal floating factory, a catamaran, a trawler with a displacement of 1,000 tons, a trawler-factory (canning) ship with a displacement of 10,000 tons, a trawler-mother ship with two fishing vessels aboard, a trawler for Arctic waters capable of working in not very dense ice field, a special high-speed ship for fish reconnaissance with modern equipment and two helicopters.

The so-called super trawlers with a cargo capacity of up to 2,000 tons and speed up to fifteen knots are being developed. Such ships will be capable of independent operations up to 10,000 miles from their bases. They will be an improved type of existing super trawlers, Grumant and Rembrandt, and an improved version of the Atlantik-class trawler, Atlantik–3. Fish canning will be done exclusively afloat, aboard special fish processing factory ships and canning trawlers. The fleet of refrigerator-transport will be enlarged and mother-factory ships with equipment capable of processing 300–400 tons of fish per day will be built. The number of ships of the Kamchatskie Gory class with over 12,000-ton cargo capacity and capability of delivering to the fishing grounds about 2,500 tons of fuel and produce and the production of about 100 tons of fresh water per day will be increased.

All large Soviet fishing trawlers will be equipped with electronic equipment controlling the effectiveness of the trawl in the process of fishing. The capacity of ship repair enterprises should grow more than 1.7 times, the volume of shore freezers and refrigerators, by 1.6 times, and the capacity of fishing ports, by fifty-six per cent.

Considerable attention is planned to be devoted to the organizational problems of the fishing industry. Further development of centralized and computerized, automatic control systems (ASU) for the fishing industry is planned. More attention will be devoted to scientific forecasting in the trends of development and operation of fishing industry. The role of the scientific research institutions of the industry will be further elevated.

It appears that the Soviet Union fishing industry well understands the problem of future fishing in the considerably depleted areas of the world ocean, and is making appropriate provisions for not only sustaining the present level, but for a considerable increase of catches.

The Soviet Union provides technical assistance to a number of less developed countries, particularly in Africa, to some Asian countries, Mauritius, and recently Peru.[103] Soviet assistance in the development

[102] *Rybnoe Khozyaistvo* (Fishing Industry) Nos. 5 and 6, 1971; *Vodnyy Transport*, issues of March 18 and 20, 1971 and July 10, 1971; *Pravda Izvestiya*, July 11, 1971; and *Nedelya*, No. 28, July 5–11, 1971.

[103] In June 1971 an agreement was signed by the Soviet Union and Peru which provides for technical aid to the latter in the construction of a fishing port, the sending of a scientific research vessel to study fishing resources in the proximity of Peru's shores, and the training of fishing industry specialists in Soviet educational institutions. *Vodnyy Transport*, June 12, 1971.

of Cuba's fishing industry has been substantial. The Soviet Union in return is obtaining considerable benefits from the countries to which assistance was granted, and many Soviet fishing vessels are being serviced in the ports of these countries. In the absence of foreign bases, the right of the Soviet fishing vessels to make those port calls are of obvious importance.

Long before the growth of the Soviet Merchant Marine and Navy caught the world's eyes, the Soviet fishing fleet had been seen in various areas of the world's oceans remote from Soviet shores. A high degree of imagination and innovation in the development of the Soviet fishing industry, has been demonstrated. The first trawlers built in the early 1950's were of rather small size, but new programs generated in late 1950's and 1960's produced a fishing fleet capable of operating thousands of miles away from their bases for up to six to eight months. Whereas the fishing vessels of many Western countries, including most of the U.S., have to return to port after five to seven days to deliver their catches, the Soviet fleet processes most of the fish afloat, right in the areas where it was caught, turning out all varieties of sea food products ready for consumption.

The fishing gear employed by the Soviet fleet is among the most efficient and advanced in the world. The development of the industry is not only being fed with considerable appropriations permitting vigorous foreign orders for ship constructions and utilization of available domestic shipbuilding facilities, but is supported by the world's most powerful research and development efforts, highly qualified scientific personnel and a well developed large educational system turning out about 10,000 specialists per year. It appears, that the most of the problems associated with such rapid development of the industry, with the notable exception of those associated with the nature of the socio-political system, have been recognized, and a search for the appropriate solutions and implementation of corrective measures is underway.

The level of the Soviet catch reached 7.8 million tons in 1970 and is steadily growing. The Soviet Union is now catching more fish and other forms of sea life than the U.S., Great Britain, West Germany, France, and Canada combined. The fear once expressed in the Western press that the Soviet fishing industry would ignore conservation practices seems to be unfounded. It appears, that the Soviet Union is honestly trying to observe fish conservation practices and is an active participant in international agreements, conventions, and organizations concerned with research, regulations, and conservation practices. In February 1973, an agreement between the U.S. and U.S.S.R. regulating fisheries in a number of areas of the World Ocean was signed.

The present Soviet fishing industry is certainly a tool for advancing national interests of the Soviet Union and it has great potential not only for supplying needed protein for the country's population, but for being an instrument of foreign aid.

The military and primarily naval value of the Soviet fishing fleet is a less easily and clearly defined phenomenon. While many of the fishing fleet ships have a para-naval value, the problem should be viewed in the light of hard facts concerning contemporary naval warfare and existing geo-political realities. It is probably fair to say that only a small portion of the Soviet fishing fleet can be used effectively by the Soviet Navy in a case of an armed conflict. The "side effect" of huge

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Soviet fishing fleet in relation to military is, of course, considerable. The meteorological and basic oceanographic research involving the collection of data on water temperature and its distribution through various layers, salinity, density, and distribution of plankton, the employment of modern sonars and other equipment and the plotting of the bottom charts, etc. is invaluable to the Soviet Navy. But in any case, the economic and political values of the Soviet fishing fleet greatly outweigh the possible military factor, and are, in the final analysis, of much greater importance.

VI. Concluding Observations

The accelerated development and gradual coordinated application of the Soviet maritime power, which permitted Soviet political, economic, and military influence to be extended globally, starting in the mid-1950s.

A. Toward a Global Role

Soviet leaders have given particular attention to the developing world, specifically the non-aligned countries. Combining political support for key countries with economic and military aid, Soviet foreign policy in the selected areas of the Third World was in most cases quite pragmatic, demonstrating the existence of a mutually interacting relationship between Soviet aims and capabilities. H. Dinerstein distinguished three types of Soviet activity:

(1) denial of influence in neutral areas to adversaries;
(2) intrusion into the opponent's sphere of influence;
(3) promotion of a revolutionary situation.

It is not difficult to see that the maritime power is needed for all three of them.

B. Economic Development and Interrelations With World Economies

The Soviet Union's own economic interests, evident in her rapidly growing foreign trade and the development of remote areas of the country rich in natural resources needed to support the growing industry, as well as defense interests were among the major factors generating the quite rapid development of maritime power, during the second half of the 1950's and the decade of the 1960's. Although having the longest coastline in the world washed by 12 seas, the Soviet Union's access to the open ocean is handicapped by the peculiar geography, which, while restricting to a degree the employment of maritime power, does not prevent it.

Moreover, the Soviet Union is not strategically located in relation to the world trade routes. These routes, however, are not the result of geography alone, but to the large degree of the economic development of certain regions of the world, particularly their industrial capability to produce for export and their purchasing power for imports. Historically, trade routes are constantly shifting, depending upon the emergence or disappearance of those factors in certain regions of the world.

Besides the military purpose, the role of the world ocean in supporting the life resources of mankind is being viewed by the Soviet Union as extremely important, and their emphasis on the development of maritime power is not accidental. The planned 37% increase in mer-

chant marine during the 1971–1975 period (5.3 million dwt) represents a continuing drive to develop efficient sea transportation, capable not only of assuring the Soviets a pattern of commerce, but also of implementing Soviet foreign policy mainly through economic and military assistance. Greater emphasis upon more efficient ships inevitably results in their specialization, a trend evident in the current Soviet shipbuilding and from their orders abroad. The Soviet Merchant Marine does not have excessive tonnage in relation to the total demand, and while the drive to increase the chartering of Soviet ships by foreign shippers continues, and will most likely increase, the chartering of foreign ships cannot at the same time be reduced substantially. Moreover, while the size and composition of the Soviet Merchant Marine are capable of influencing shipping policies in certain regions, they are not considered great enough to dictate those policies, particularly world-wide. The Soviets are also interested in the profit to be gained, and they are unlikely to operate on uneconomical terms. As members of various international shipping organizations, the Soviets are obliged to observe the rules imposed by them.

C. Economic Use of the Seas: Fishing and Oceanography

The inability of Soviet agriculture to meet requirements for protein will most likely continue. This factor alone represents a strong stimulus for further development of a Soviet high sea fishing fleet despite a declining fish stock and rising unit cost. In addition, the demand for higher efficiency and larger fishing ships and the necessity to search for new fishing groups, which also requires larger and more sophisticated support ships, will intensify. Soviet cooperation in conserving marine resources is virtually assured.

Soviet oceanographic efforts represented by the joint research of numerous scientific organizations and coordinated by the Academy of Sciences has no equal, at least in its scale. Benefits obtained by the merchant marine and the fishing fleet from oceanographic research are numerous and growing.

The Soviet shipbuilding industry continues to perform satisfactorily, being neither overloaded nor under utilized. Its output supplemented by sizeable foreign deliveries appears to be satisfying the Soviet demands for ships. Large Soviet orders for ship construction abroad have played a multiple role. Not only did they provide conditions for the rapid development of the merchant marine and the fishing and oceanographic fleets, and permitted the Soviet shipbuilding industry to implement extensive naval programs, but they assured the avoidance of an overcapacity in the shipbuilding industry. Of particular importance has been the role of the Warsaw Pact countries shipbuilding industries with a considerable degree of specialization in certain types of ships built and mutual deliveries.

Some historians, such as Robert Kerner, referred to a historic Russian "urge to the sea" as a form of manifest destiny in Eurasia. Now the Soviet Russians may be said to seek access to all the seas of the world to satisfy their new role in history.

SOVIET FOREIGN AID: SCOPE, DIRECTION, AND TRENDS

By Leo Tansky

CONTENTS

I. Summary and Conclusions

Since 1954, the Soviet Union has made available $16.7 billion of economic and military aid to Third World [1] countries. More than $11 billion have been spent. About 70% of the aid committed has gone to six countries; 40% to Egypt and India.

The basic objectives, of the USSR in dispensing aid have remained stable over this period—to expand its influence at the expense of the other major powers and to offer itself as a model for economic development for the recipient countries. Although these political and ideological motivations remain the major determinants for Soviet aid programs, economic considerations also are becoming important. Many recent aid agreements have been designed largely to increase imports of fuels, raw materials, and consumer goods and to create markets for Soviet machinery and equipment.

The cost of foreign aid—as measured by the net outflow of economic resources—is now less than 0.03% of GNP. In recent years, Soviet aid outlays have leveled off while LDC aid repayments have risen rapidly reducing even further Moscow's foreign aid burden. As long as the economic costs remain low and the political and economic returns high, Moscow will continue to employ foreign aid as the primary instrument for expanding its influence in the Third World.

[1] The terms Third World and less developed countries (LDCs) are used interchangeably in this paper and include the non-Communist countries of Asia, except Japan; Africa, except the Republic of South Africa; and Latin America.

II. Introduction

The USSR has employed foreign aid as the primary instrument for promoting its interests in the Third World for almost 20 years. Throughout these years, Moscow's basic objectives have remained largely unchanged—to erode Western influence and substitute its own; to counter the Chinese challenge to Soviet "leadership" of the national liberation movements; and to convince Third World countries that socialism (i.e., Communism) offers the only solution to their economic problems. The Soviet Union has made available some $16.7 billion of economic and military aid since 1954 in pursuit of these goals.

Tactically, Moscow's program also has not changed much throughout the two decades. Economic and/or military aid continue to be used where appropriate to establish, maintain, and expand the Soviet presence in aid-receiving countries. In the initial years of the program, economic aid was used to gain entry to such South and East Asian countries as Afghanistan, Burma, Cambodia, India, Indonesia, and Sri Lanka (Ceylon). Military aid was used in the Middle East, and not until Egypt, Iraq, Syria, and Yemen (San'a) signed arms accords with Moscow did they receive economic aid.

III. Ideological Foundations

Although military aid usually has the greater immediate political impact, Moscow considers the economic aid program more important in forging long-run ties with Third World countries. The economic aid mechanism is a conduit through which flows the materials, personnel, and ideas that Moscow hopes will encourage the growth of socialist institutions in aid-receiving countries and their ultimate "transition to socialism."

During Khrushchev's regime, Soviet theoreticians held that Moscow's aid was encouraging its aid recipients to pursue a "non-capitalist path of development" and to achieve the status of a "national democratic state." The concept emerged during one of Moscow's early ideological gyrations to justify its aid to military dictatorships and other "non-progressive" regimes. To achieve the status of a national democracy a country had to nationalize private investment and generally expand the state sector; pursue an anti-imperialist (i.e. anti-Western) foreign policy; establish extensive economic and cultural relations with socialist countries at the expense of the capitalist nations; and permit the "working class in alliance with the peasantry and progressive elements" to participate in the country's political and economic activities.[2] Egypt (also Algeria, Iraq, and Syria to varying degrees) was held up as a prime example of a former colonial country which, with the aid of the "socialist camp," was proceeding along the proper path.[3]

Khrushchev's euphoria has not been shared by his followers. They have been less sanguine about such achievements in the near future, particularly after the demise of such "revolutionary democrats" as Ben Bella, Keita, Nkrumah, and Sukarno, the massacre of Sudanese Communists by a leftist regime in Khartoum, and the ouster of Soviet military personnel from Egypt—Moscow's favored aid client. Never-

[2] Supplement to *New Times* (Moscow) No. 50, 1960.
[3] K. Ivanov, "The National-Liberation Movement and Non-Capitalist Path of Development," *International Affairs*, Moscow, September 1964, p. 42.

theless, Soviet literature still expounds on the use of aid to achieve Khrushchev's goals. One no longer sees the emphasis on the national democratic state, but theoreticians still claim to judge progress in terms of nationalization, expansion of relations with the "socialist camp," and the domestic roles played by "progressive elements." [4]

IV. The Economic Aid Program

A. Magnitude and Direction

Since 1954, the Soviet Union has extended about $8.2 billion of economic aid to 44 less developed countries (LDCs).[5] Nearly 75% of the total aid committed has gone to Middle Eastern and South Asian countries (see Tables 1 and 3). Afghanistan, Egypt, India, Iran, Iraq, and Turkey have been allocated about 65%.

TABLE 1.—U.S.S.R.: EXTENSIONS OF ECONOMIC AID TO LESS DEVELOPED COUNTRIES, BY AREA, 1954–72

[In millions of U.S. dollars]

	1954–72	1954–60	1961–64	1965	1966	1967	1968	1969	1970	1971	1972
Total	8,196	2,212	1,582	416	1,244	269	374	462	194	862	581
Africa	1,236	209	535	28	77	9	.....	135	51	192	.....
East Asia	154	124	23	3	4	.....	.....	.....	.....	.....	.....
Latin America	445	30	.....	15	85	55	2	20	56	38	144
Middle East	3,336	880	549	84	422	200	178	287	76	418	242
South Asia	3,025	969	475	286	656	5	194	20	11	214	195

B. The Khrushchev Years, 1954–64

As the Soviet economic aid program has grown, it has experienced severe annual fluctuations and periodically undergone structural changes. Largely Khrushchev's creation, the program during its first decade reflected his flamboyant style. He offered aid to any willing country and generally extended umbrella type credits before agreeing on specific projects. The early years were largely ones of initial penetration; years in which Moscow sought to manipulate the "neutralist spirit" of the Bandung Conference of 1955. Aggregate economic aid commitments were not large and went mainly to Asia.

The program underwent its most rapid expansion during 1958–61 and assumed the basic character that still prevails. More than $2 billion were extended, about $855 million in 1959 alone—still one of the largest years for new Soviet commitments. More significant was Moscow's willingness to commit funds for national economic development plans. About $1.8 billion were provided for the development of Afghanistan, Egypt, India, Indonesia, and Iraq. India alone received pledges of about $550 million; Egypt, $500 million. Soviet-African relations also developed rapidly in these years with the first aid extensions to Ethiopia, Ghana, Guinea, Mali, Somalia, Sudan, and Tunisia.

The level of commitments dropped sharply in 1962–63, to an annual level of about $150 million. This decline was almost wholly the result of the huge backlog of commitments built up in previous years. Exten-

[4] See, for example, R. Ulyanovsky, "The Third World—Problems of Socialist Orientation," *International Affairs*, Moscow, No. 9, 1971.

[5] This study is concerned only with Soviet aid to non-Communist less developed countries. For comparative purposes, data on Soviet economic aid to other Communist countries is presented in Table 4.

sions bounced back to $825 million in 1964, the last year of Khrushchev's rule. Moscow responded quickly to opportunities for further participation in Egyptian and Indian development programs and, to a lesser extent, to the Chinese challenge to Soviet influence among Afro-Asian countries.

C. The Post–Khrushchev Era

After Khrushchev's fall from power in 1964, his successors adopted a more conservative style in foreign aid. Moscow became more cautious in announcing specific credits before cost surveys were completed, more selective in its recipients, and more inclined toward countries that could absorb economic aid at a satisfactory pace. Since 1964, about 80% of Soviet aid has been concentrated in countries which form an arc running from the eastern Mediterranean, through the Red Sea, to the Arabian Sea. The conclusion of large economic aid agreements with Iran and Turkey was particularly gratifying to Moscow because it marked Soviet entry into countries belonging to Western military alliances.

Africa became secondary in Soviet policy considerations. Whereas Khrushchev committed about 20% of Soviet economic aid to Africa, his successors have extended only 10%. And about half of that has gone to Algeria and Morocco. Some aid resources have been allocated to Latin America in recent years as opportunities have opened in Chile and Peru.

D. Sectoral Distribution

Soviet aid always has had a large industrial content. The emphasis on this sector has become even more pronounced in recent years. Perhaps as much as 65% is being channeled into industrial projects compared with half during the mid-1960s. About $1.7 billion, or more than 20% of total Soviet aid, has been committed for the construction of steel plants. Moscow has extended about $420 million for the construction of the Iskenderun steel mill in Turkey, which now outstrips in aid costs China's $400 million for the Tan-Zam Railroad and Moscow's $325 million for the Aswan High Dam.[6] More than 15% of Soviet aid has gone for agricultural and multipurpose projects, 10% for mineral development, and 10% for transportation facilities. Less than 5% has been provided in commodities and foreign exchange.

E. Drawings on Soviet Aid[7]

Although the annual level of Soviet extensions has fluctuated, aid expenditures have risen almost constantly. More than $4 billion—or half of total aid commitments—had been drawn by the end of 1972. About $1.2 billion were spent during 1969–71 with a peak of $420 million reached in 1971. Aid outlays during 1972 fell to around $400 million because of lower levels of project construction in Egypt, India, and Iran. The fact that Afghanistan, Egypt, India, and Iran account

[6] In March of this year, Moscow extended nearly $190 million to expand Iran's Isfahan steel plant. This commitment raises to $500 million the amount allocated for the plant, making it the costliest Communist aid undertaking.

[7] Drawings are taken from Department of State, *Communist States and Developing Countries: Aid and Trade in 1971*, May 15, 1972. Their figures are derived largely from data in the annual issues of the Soviet Ministry of Foreign Trade publications, *Vneshnyaya Torgovlya SSSR*.

for nearly two-thirds of total drawings but about half of total extensions indicates the slow overall progress of Soviet programs.

The difficulties Moscow encounters in most LDCs are common to all aid donors. Most cannot absorb project type aid rapidly because they lack adequate skilled and professional personnel, possess primitive infrastructures, and fail to acquire sufficient funds to finance the local costs of these projects. However, the character of the Soviet program compounds these problems because it makes no provision for local cost financing. Although the aid receiving countries' share of project expenditures often is as high as 50%, the USSR had provided only about 5% of its total aid in the form of commodities to be sold locally for local currency to cover those costs.

The success Moscow has achieved in pushing forward its programs in Egypt, India, and Iran reflects their greater absorptive capacity in terms of available financial and human resources. The rapid rate of project construction in Afghanistan stems from Soviet willingness to provide large numbers of professional, administrative, and technical personnel in conjunction with a commodity aid program to raise the local currency for Soviet projects.

F. Terms and Repayment of Economic Aid

The terms of repayment for Soviet economic aid generally fall into two categories. The largest consists of development project credits which call for repayment over 12 years at 2.5% interest, usually beginning one year after the project is completed. Occasionally, a longer repayment period is allowed, such as 19–24 years and 6–8 years grace for some credits to Afghanistan. The second category covers trade credits with 8–10 years to repay at slightly higher interest rates. Only 5% of Soviet aid has been provided as grants.

As deliveries of goods and services under credits have expanded, aid repayments by the LDCs also have increased. By the end of 1972, an estimated $1.4 billion had been repaid on the more than $4 billion in economic aid obligations incurred by LDCs. Most of these repayments have taken place during the past six years. Such payments totaled an estimated $10 million in 1959, jumped to more than $100 million in 1967, and reached a peak of $260 million in 1972.

The rising volume of repayments in the face of slower rising aid deliveries has narrowed the net Soviet aid outflow. It dropped from $225 million in 1970 to $140 million in 1972, lessening the already light aid burden on the Soviet economy. The net aid outflow in 1972 represented less than 0.03% of Soviet GNP.

V. Technical Assistance

A. Economic Technicians

An important part of Moscow's aid activities is the provision of technicians to compensate for shortages of technical, administrative, and managerial personnel needed to implement its aid projects. Such personnel generally supervise construction, assemble machinery and equipment, and train local counterpart technicians. There also are large number of nonproject technicians working as doctors, teachers, and advisors to official organizations.

As the pace of early Soviet aid activities quickened, the numbers of personnel sent to the LDCs grew rapidly. In 1955, an estimated 400 technicians were located in LDCs; in 1958, more than 1,600; and in 1962, about 8,700. Since 1965, the number employed has fluctuated between 10,000–12,000.

The services of project-type technicians generally are dispensed within the framework of specific project credits, thus resembling the technical services made available by Western contractors. Expenditures for the services of Soviet technicians consume some 15%–20% of the project credit.

The foreign exchange costs of Soviet technical services usually include salaries, round trip plane fare, leave accumulated at a rate of about three days per month, round trip fare to spend leave in the USSR, and life insurance premiums. If a technician brings his family, the recipient country must pay their round trip fares and a family transfer allowance. The host country also is responsible for such local expenditures as medical care, hospitalization, office space, local transportation, and furnished quarters.[8] These services are costly especially in contrast to Chinese and most Western technicial assistance which are largely grant aid.

B. Technical and Academic Training in the USSR

In addition to on-the-job training provided at construction sites and technical training in Soviet-built centers in the host country, Moscow also accepts local personnel for training in the USSR. This type of training consists mainly of 6 to 12 month programs at industrial facilities and partly of specialized training of up to three years at Soviet technical institutes. Perhaps 15,000 LDC personnel have received such training. Some 31,000 Third World students also have gone to the USSR for academic training since 1955—about half from Africa—under Soviet scholarships.

VI. Military Assistance

In the short run, military assistance continues to be the more dynamic of the two main elements comprising Moscow's foreign aid program. Because of the political framework within which such accords are concluded, Moscow becomes associated with the recipient's security needs and national aspirations. Current agreements, however, no longer create the shock waves in Western capitals that they once did. Soviet military sales flow into the lucrative Third World arms market which currently runs at $2.5 billion–$3 billion annually from all sources.[9]

Since 1955, the USSR has made available about $8.5 billion of arms aid (see Table 2). Some 95% has gone to eight countries—about 70% to Egypt, India, Indonesia, and Iraq.

[8] For sample agreements with such detail see Klaus Billerbeck, *Soviet Bloc Foreign Aid to the Underdeveloped Countries*, (Hamburg: Hamburg Archives of World Economy, 1960). Although the publication is somewhat dated, the contract requirements have not changed.

[9] U.S. Arms Control Disarmament Agency, *The International Transfer of Conventional Arms, an Interim Report to the Congress*, January 1973. The $2.5–$3 billion does not include arms aid to Indochina.

TABLE 2.—*U.S.S.R.: Extensions of military aid to less developed countries, by country, 1955–72*

[In millions of U.S. dollars]

Total	$8,475
Egypt	2,685
India	1,220
Indonesia	1,100
Iraq	1,000
Syria	715
Iran	480
Afghanistan	455
Algeria	395
Other	425

Because the Soviet military aid program responds to opportunities presented by regional conflicts and LDC internal security needs, its flow is highly erratic. Nearly 30% of total commitments occurred in 1970–71, reflecting the large Egyptian air defense build up, Indian preparations for war with Pakistan, and Syrian and Iraqi tensions with Israel and, for the latter, concern over Iran's arms acquisitions. These four Soviet arms clients acquired some $2 billion of arms during those two years.

Another feature of the program which keeps its annual level high is the constant upgrading of weapons systems and replacement of worn out equipment. The less complex MIG–15 and 17 fighter aircraft are being replaced or supplemented with various versions of the MIG–21 and the SU–7 fighter bomber; T–34 tanks with T–54 and T–62 tanks; conventional antiaircraft artillery with SA–2, SA–3, and SA–6 surface-to-air missile systems. Such cycles are likely to continue since Moscow is prepared to provide most types of arms except nuclear and strategic weapons.

These new generations of weapons are not only expensive but also highly complex. Consequently, Moscow must maintain a large number of advisers and technicians in the LDCs to train indigenous personnel in the use and maintenance of those arms. For the past several years, an estimated 10,000 Soviet military personnel have been stationed abroad to perform these functions. In addition, as many as 2,000 LDC personnel have been going to the USSR annually for training not available at home.

VII. Moscow's Economic Benefits

While political and ideological considerations continue as the dominant motivations for Soviet aid, in recent years there has been a surge in agreements generated by Moscow's economic requirements. All indications point to a rapid growth of these accords, e.g., joint projects and beneficial aid and trade arrangements.

The dam built on the Aras River between Iran and the USSR is providing electric power and water for irrigation to both countries. Soviet assistance for the Kindia bauxite deposits in Guinea will be repaid in bauxite. Soviet-built pipelines in Afghanistan and Iran are carrying natural gas to the USSR as aid repayments; gas which Moscow is purchasing at the low prices of $5.70 to $6.60 per 1,000 cubic

meters.[10] The gas is supplementing dwindling supplies in the Azerbaijan and Turkmen Republics and saving Moscow the distribution costs of piping it in from distant fields in Central Asia. A second pipeline is being built in Afghanistan and another is planned in Iran.

The Soviets also profit from the assistance they provide for building port facilities and developing fishing industries. The Soviet-built shipyard at Alexandria provides repair facilities for Soviet vessels and is building merchant ships for the Soviet Union as payment. Soviet aid to fisheries is repaid in storage and repair facilities, food and fuel supplies, and shore privileges for Soviet crews. These services enable Soviet vessels to operate for longer periods before returning to their home ports. Moscow has such access to ports in Chile, Peru, Senegal, Guinea, Algeria, Egypt, Sri Lanka, and Bangladesh.

Of particular significance is Moscow's assistance to Middle Eastern oil development, for which the Soviets are providing nearly $450 million of aid. The USSR supports the establishment of national oil companies in these countries, and hopes to develop additional sources of supply to meet its own expanding exports requirements. By 1980, Soviet oil production may not be adequate to meet domestic needs and still (a) fill most of Eastern Europe's requirements and (b) maintain exports of oil to Western Europe.[11] Imports of Soviet crude by East European countries have doubled since 1965, and Moscow already has advised these countries to find supplemental sources of oil in the Middle East.

The recently opened North Rumaylah oil fields in Iraq are being developed with some $200 million of Soviet aid. This aid will be repaid in crude oil that probably will be reexported to other Communist countries. East European countries have provided an additional $100 million for Iraq's petroleum development, also to be repaid in oil. They also will receive Iranian oil as repayment for economic aid.

In addition to aid repayments in oil, the USSR and Eastern Europe are purchasing Middle Eastern crude commercially. By 1975, shipments on Soviet and East European account will reach 35 million metric tons annually under both arrangements. Although these shipments represent only a small part of Soviet requirements, they will equal about one-third of East European consumption in 1975.

Aid repayments and trade in other goods also are becoming significant. Soviet imports of manufactured goods, largely from newly created industries. have grown from almost nothing to about 20% of Moscow's imports from the LDCs. These imports—much of them from Soviet-built plants and not marketable in the West—include tractors, industrial machinery, aluminum products, rolled steel, wire, automobile stampings, clothing, fabrics, footwear, furniture, and other consumer goods. About 45% of the Soviet imports from India in 1971 were manufactures, as were 40% of its imports from Egypt and 25% of its imports from Iran. Moscow is willing to import large amounts of these goods because they help LDCs repay their aid debts, use much of the unused capacities of Soviet-built plants, and help the USSR

[10] The price for Soviet gas to be delivered to Western Europe is about $12 per 1,000 cubic meters.

[11] The USSR already has run into production difficulties. Output in 1972 was well below the planned goals. This could lead Soviet planners to look for supplementary sources outside the USSR much sooner.

meet some of its domestic demand for such goods. As one Soviet author points out:

> Soviet purchases of their traditional exports and of products of their young national industries are of great importance for this group of countries. Our economic ties with these countries have also begun to play a greater role in solving the Soviet Union's national economic tasks. Our increased purchases in these countries, and the delivery of their products in repayment of Soviet credits enable the USSR to organize a better supply of many types of raw materials for its population for foodstuffs and consumer goods more fully.[12]

Along the same lines, another states:

> The resources received in redemption of the credits and in payment of interest are utilized by Soviet foreign trade organizations for the purchase in India of tea, wool, jute, coffee, tobacco, as well as rolled ferrous metal, products of engineering plants and manufactured consumer goods. The Arab Republic of Egypt redeems Soviet credits with such traditional Egyptian exports as cotton, yarn, fabrics, and rice as well as the products of enterprises built with Soviet assistance—ferrous metals, stampings, parts for automobiles and tractors and other goods.[13]

VIII. Prospects

The aid program will remain a major element in Soviet policy toward the Third World. The program remains the only effective tool for expanding Soviet influence in these countries and for countering the influence of other major powers. New extensions of economic aid will rise and fall in response to new opportunities and Soviet short-run economic capabilities. Large sums probably will be made available to Egypt and India over the next few years as these countries move into their next development programs.

Heavy emphasis also will continue to be placed on military aid because of its greater political impact and the immediate dependence it creates. The political setback in Egypt did not result from Moscow overplaying its hand but from its unwillingness to become more involved. The Moscow-Cairo arms relationship has shown that the Kremlin's primary interests are in Western Europe, China, and the United States and that it will not permit the secondary concerns to determine its relations with the major powers. It is likely that, on balance, Moscow was relieved with the end of what it probably considered an overcommitment in Egypt and the return to a normal aid relationship.

Economic returns are not likely to be a major concern in Moscow's policy considerations over the near term. Nor is it likely that the Soviets will permit any economic dependency to develop. And yet, Soviet literature frequently refers to the developing international specialization of labor of socialist countries with the Third World, a policy that appears to be emerging in the increasing volume of Soviet imports of goods produced in Soviet-built plants. The development represents a significant trend in Soviet policy in the LDCs, a trend that is more likely to establish the long range abiding Soviet-LDC ties than any of Moscow's other foreign policy tools.

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[12] V. Smirnov, "To Our Mutual Advantage and in the Interests of the Economic Independence of the Developing Countries," *USSR Foreign Trade*, Moscow, December 1972, p. 27.
[13] D. Chertkov, "The USSR and Developing Countries: Economic Relations," *International Affairs*, Moscow, August 1972, p. 59.

Appendix

Note on Sources

The detailed information on Soviet foreign aid contained in this study is drawn from numerous official and non-official publications available to the public. A primary source for data concerning the Soviet program in the LDCs—aid extensions, drawings on credits, technical assistance, and military aid—is the annual reviews of the Communist aid programs published by the Bureau of Intelligence and Research of the U.S. Department of State. The last of the series, "Communist States and Developing Countries: Aid and Trade in 1972," was scheduled to be published in June 1973.

Official publications, journals, and newspapers from LDCs and the USSR also have been invaluable sources. Useful non-official and academic discussions of Soviet aid include: Vassil Vassilev, *Policy in the Soviet Bloc on Aid to Developing Countries*, Development Centre Studies. OECD, Paris, 1969; Robert S. Walters, *American and Soviet Aid: A Comparative Analysis*, University of Pittsburgh Press, Pittsburgh, 1970; Uri Ra'anan, *The USSR Arms to the Third World: Case Studies in Soviet Foreign Policy*, The M.I.T. Press, Cambridge, 1969.

TABLE 3.—U.S.S.R.: EXTENSIONS OF ECONOMIC AID TO LESS DEVELOPED COUNTRIES, BY COUNTRY 1954–72

[In millions of U.S. dollars]

	1954–72	1954–64	1965	1966	1967	1968	1969	1970	1971	1972
Total	8,196	3,794	416	1,244	269	374	462	194	862	581
Africa	1,236	744	28	77	9	--	135	51	192	--
Algeria	421	231	--	1	--	--	--	--	189	--
Ethiopia	102	102	--	--	--	--	--	--	--	--
Ghana	89	89	--	--	--	--	--	--	--	--
Guinea	165	70	--	3	--	--	92	--	--	--
Kenya	44	44	--	--	--	--	--	--	--	--
Mali	56	55	--	--	--	--	1	--	--	--
Morocco	88	--	--	44	--	--	--	44	--	--
Sierra Leone	28	--	28	--	--	--	--	--	--	--
Somalia	66	57	--	9	--	--	--	--	--	--
Sudan	64	22	--	--	--	--	42	--	--	--
Tanzania	20	--	--	20	--	--	--	--	--	--
Tunisia	34	34	--	--	--	--	--	--	--	--
Other	59	40	--	--	9	--	--	7	3	--
East Asia	154	147	3	4	--	--	--	--	--	--
Burma	14	14	--	--	--	--	--	--	--	--
Cambodia	25	21	--	4	--	--	--	--	--	--
Indonesia	115	112	3	--	--	--	--	--	--	--
Latin America	445	30	15	85	55	2	20	56	38	144
Argentina	45	30	15	--	--	--	--	--	--	--
Bolivia	30	--	--	--	--	--	--	28	2	--
Brazil	85	--	--	85	--	--	--	--	--	--
Chile	235	--	--	--	55	--	--	--	36	144
Peru	28	--	--	--	--	--	--	28	--	--
Other	22	--	--	--	--	2	20	--	--	--
Middle East	3,336	1,429	84	422	200	178	287	76	418	242
Egypt	1,198	1,002	--	--	--	--	--	--	196	--
Greece	84	--	84	--	--	--	--	--	--	--
Iran	562	41	--	289	--	178	--	54	--	--
Iraq	549	184	--	--	--	--	121	22	222	--
Syria	317	100	--	133	--	--	--	--	--	84
Turkey	534	10	--	--	200	--	166	--	--	158
Yemen (Sana)	92	92	--	--	--	--	--	--	--	--
South Asia	3,025	1,444	286	656	5	194	20	11	214	195
Afghanistan	826	553	11	1	5	127	--	3	5	121
Bangladesh	74	--	--	--	--	--	--	--	--	74
India	1,593	797	225	571	--	--	--	--	--	--
Nepal	20	20	--	--	--	--	--	--	--	--
Pakistan	474	44	50	84	--	67	20	--	209	--
Sri Lanka	38	30	--	--	--	--	--	8	--	--

TABLE 4.—U.S.S.R.: EXTENSIONS OF ECONOMIC AID TO OTHER COMMUNIST COUNTRIES, BY COMMUNIST COUNTRY, 1954–72

[In millions of U.S. dollars]

	1954–72	1954–64	1965	1966	1967	1968	1969	1970	1971	1972
Total	16,175	5,500	1,115	695	1,240	1,305	1,360	750	2,125	2,085
Eastern Europe	5,105	[1] 2,900	30	.....	10	500	555	.....	1,110	.....
Bulgaria						335	555			
Czechoslovakia										
East Germany										
Hungary					10	165				
Poland									1,110	
Romania			30							
Far East	3,280	[2] 1,000	85	150	200	270	325	440	410	400
People's Republic of China										
North Korea						30	75	95	95	150
North Vietnam			85	150	200	240	250	345	315	250
Other	7,790	[3] 1,600	1,000	545	1,030	535	480	310	605	1,685
Albania										
Cuba			390	415	480	535	480	310	505	1,025
Mongolia			570	.....	550	.....			100	120
Yugoslavia			40	130	.....					540

[1] Estimates not available for country by year during 1954–64, but most of it went to Bulgaria and East Germany.
[2] Estimates not available for country by year during 1954–64, but the largest part probably went to China.
[3] Estimates not available for country by year during 1954–64, but most of it went to Cuba and Mongolia.